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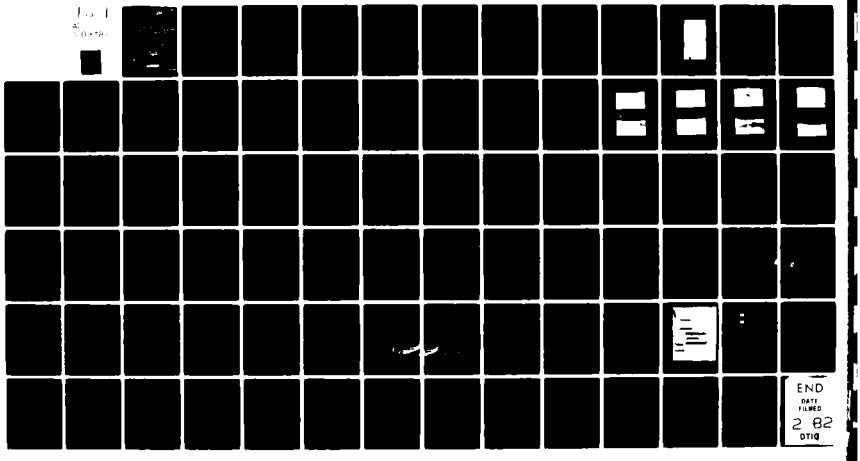

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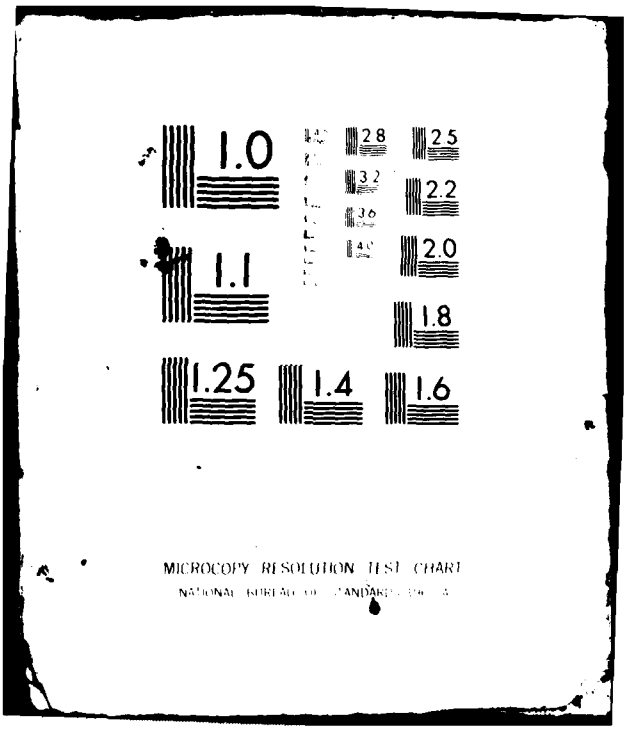
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SUSQUEHANNA RIVER BASIN

NANTICOKE CREEK WATERSHED PROJECT-FLOODWATER RETARDING DAM SITE 9-6

BROOME COUNTY, NEW YORK

INVENTORY NO. N.Y. 628

[redacted]

SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

REPORT DOCUMENTATION PAGE		READ INSTRUCTIONS BEFORE COMPLETING FORM
1. REPORT NUMBER	2. GOVT ACCESSION NO. AD-A109 782	3. RECIPIENT'S CATALOG NUMBER
4. TITLE (and Subtitle) Phase I Inspection Report Floodwater Retarding Dan No. 9 C Susquehanna River Basin, Broome County, NY Inventory No. 628		5. TYPE OF REPORT & PERIOD COVERED Phase I Inspection Report National Dam Safety Program
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18. SUPPLEMENTARY NOTES

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Dam Safety
National Dam Safety Program
Visual Inspection
Hydrology, Structural Stability.
Floodwater Retarding Dam No. 9 C
Susquehanna River Basin
Broome County

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

This report provides information and analysis on the physical condition of the dam as of the report date. Information and analysis are based on visual inspection of the dam by the performing organization.

Based on the evaluation of the existing conditions, the condition of the Nanticoke Creek Watershed Project - Floodwater Retarding Dam Site 9-C is considered to be good. The examination of documents and visual observations did not reveal conditions which constitute a hazard to human life or property.

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SECURITY CLASSIFICATION OF THIS PAGE (When Data Entered)

The spillway capacity was evaluated according to the recommended procedure and was found to pass the required spillway design flood of 100 percent of the Probable Maximum Flood (PMF). Therefore, the spillway capacity is rated to be adequate.

PREFACE

This report is prepared under the guidance contained in the Recommended Guidelines for Safety Inspection of Dams, for Phase I Investigations. Copies of these guidelines may be obtained from the Office of Chief of Engineers, Washington, D.C. 20314. The purpose of a Phase I Investigation is to identify expeditiously those dams which may pose hazards to human life or property. The assessment of the general condition of the dam is based upon available data and visual inspections. Detailed investigation and analyses involving topographic mapping, subsurface investigations, testing, and detailed computational evaluations are beyond the scope of a Phase I Investigation; however, the investigation is intended to identify any need for such studies.

In reviewing this report, it should be realized that the reported condition of the dam is based on observations of field conditions at the time of inspection along with data available to the inspection team. In cases where the reservoir was lowered or drained prior to inspection, such action, while improving the stability and safety of the dam, removes the normal load on the structure and may obscure certain conditions which might otherwise be detectable if inspected under the normal operating environment of the structure.

It is important to note that the condition of a dam depends on numerous and constantly changing internal and external conditions, and is evolutionary in nature. It would be incorrect to assume that the present condition of the dam will continue to represent the condition of the dam at some point in the future. Only through frequent inspections can unsafe conditions be detected and only through continued care and maintenance can these conditions be prevented or corrected.

Phase I inspections are not intended to provide detailed hydrologic and hydraulic analyses. In accordance with the established Guidelines, the spillway test flood is based on the estimated "Probable Maximum Flood" for the region (greatest reasonably possible storm runoff), or fractions thereof. Because of the magnitude and rarity of such a storm event, a finding that a spillway will not pass the test flood should not be interpreted as necessarily posing a highly inadequate condition. The test flood provides a measure of relative spillway capacity and serves as an aide in determining the need for more detailed hydrologic and hydraulic studies, considering the size of the dam, its general condition and the downstream damage potential.

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
NANTICOKE CREEK WATERSHED PROJECT -
FLOODWATER RETARDING DAM SITE 9-C
N.Y. 628
DEC I.D. NO. 85D-3443
SUSQUEHANNA RIVER BASIN
BROOME COUNTY, NEW YORK

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PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM

Name of Dam:	Nanticoke Creek Watershed Project - Floodwater Retarding Dam Site 9-C N.Y. 628
State Located:	New York
County Located:	Broome
Stream:	Nanticoke Creek (a tributary of the Susquehanna River)
Date of Inspection:	March 25, 1981 and June 3, 1981

ASSESSMENT

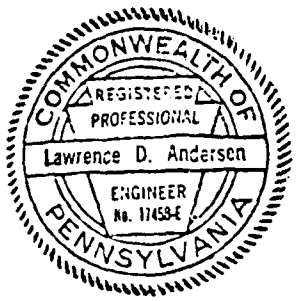
Based on the evaluation of the existing conditions, the condition of the Nanticoke Creek Watershed Project - Floodwater Retarding Dam Site 9-C is considered to be good. The examination of documents and visual observations did not reveal conditions which constitute a hazard to human life or property.

The spillway capacity was evaluated according to the recommended procedure and was found to pass the required spillway design flood of 100 percent of the Probable Maximum Flood (PMF). Therefore, the spillway capacity is rated to be adequate.

The following recommendation should be implemented within three months from notification to the owner:

1. An emergency action plan should be developed, including a formal warning system to alert the downstream residents in the event of an emergency.

Assessment - Nanticoke Creek Watershed Project - Floodwater Retarding Dam Site 9-C



Lawrence D. Andersen, P.E.
Vice President
D'Appolonia Consulting Engineers, Inc
Pittsburgh, Pennsylvania

Approved by:

Col. W. M. Smith, Jr.
New York District Engineer

Date: 14 Aug 81

NANTICOKE CREEK WATERSHED PROJECT -
FLOODWATER RETARDING DAM SITE 9-C
N.Y. 628
DEC I.D. 85D-3443
MARCH 25, 1981

OVERVIEW

PHASE I INSPECTION REPORT
NATIONAL DAM SAFETY PROGRAM
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N.Y. 628
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SUSQUEHANNA RIVER BASIN
BROOME COUNTY, NEW YORK

SECTION 1: PROJECT INFORMATION

1.1 GENERAL

a. Authority

The Phase I Inspection reported herein was authorized by the Department of the Army, New York District, Corps of Engineers, to fulfill the requirements of the National Dam Inspection Act, Public Law 92-367.

b. Purpose of Inspection

The inspection was to evaluate the existing conditions of the subject dam to identify deficiencies and hazardous conditions, determine if they constitute hazards to life and property, and recommend remedial measures where necessary.

1.2 DESCRIPTION OF PROJECT

a. Dam and Appurtenances

Nanticoke Creek Watershed Project - Floodwater Retarding Dam Site 9-C consists of an earth embankment approximately 870 feet long with a maximum height of about 33 feet from the downstream stream bed. The embankment has a crest width of 14 feet and an upstream slope of 3 horizontal to 1 vertical, with a 10-foot-wide berm near normal pool level. The downstream slope is 2.5 horizontal to 1 vertical. The upstream and downstream faces of the dam are covered with grass.

The spillway facilities for the dam consist of two vegetated earth emergency channels, one on each abutment, and a riser-type primary spillway located at the center of the dam. The emergency spillways are trapezoidal earth channels with a base width of 100 feet and side slopes of 3 horizontal to 1 vertical on the embankment side and 2.5 horizontal to 1 vertical on the abutment side. The primary spillway structure is comprised of a concrete intake riser structure which discharges into a 36-inch reinforced concrete pipe terminating at a concrete impact basin at the downstream toe. Under normal conditions, the reservoir level is maintained at the crest level of a two-foot two-inch-wide by two-foot-high rectangular orifice on the upstream side of the riser. The primary spillway discharge pipe has been provided with antiseep collars.

The dam is equipped with a 12-inch-diameter reservoir drainpipe extending from the upstream toe to the primary spillway riser. Flow through the pipe is controlled by a manually operated sluice gate at the riser.

b. Location

The dam is located on Nanticoke Creek, a tributary of the Susquehanna River approximately three miles northwest of Nanticoke in Broome County, New York. Plate 1 illustrates the location of the dam.

c. Size Classification

The dam is classified as small based on its 33-foot height and 899 acre-feet maximum storage capacity.

d. Hazard Classification

The dam is classified to be in the high hazard category. The Village of Nanticoke located about three miles downstream from the dam and two farmhouses located about two miles downstream from the dam are considered to be within the potential floodplain of Nanticoke Creek.

It is estimated that failure of the dam under maximum pool level would cause loss of more than a few lives and appreciable property damage in this area.

e. Ownership

The dam is owned and operated by Broome County, New York. (Address: Broome County Commissioners, P.O. Box 1766, Binghamton, New York 13902, (607) 772-2100)

f. Purpose of Dam

The dam is a floodwater retarding structure.

g. Design and Construction History

The dam was designed by the U.S. Department of Agriculture, Soil Conservation Service (SCS) in 1965. Construction of the dam was completed in June 1967.

h. Normal Operating Procedure

The reservoir is normally maintained at the crest level of the uncontrolled orifice on the upstream side of the primary spillway riser at Elevation 1189.6 (USGS Datum). The primary spillway crest is at Elevation 1197.8, and the emergency spillway crests are located at Elevation 1206.0.

1.3 PERTINENT DATA

Elevations referred to in this section and subsequent sections of the report were obtained from design and as-built drawings.

a. Drainage Area (sq. mi.)	4.36
b. Discharge at Dam (cfs)	
Principal spillway at top of dam	193
Auxiliary spillway at top of dam	8281
Reservoir drain at top of dam	20±
Total spillway capacity at top of dam	8474
c. Elevation (USGS Datum) (feet)	
Top of dam	1211.3
Auxiliary spillway crest	1206.0
Principal spillway crest	1197.8
Low stage inlet, invert elevation (normal pool)	1189.6
Reservoir drain, invert elevation	1182.0
d. Reservoir (acres)	
Surface area at top of dam	69.7
Surface area at crest of auxiliary spillway	55.8
Surface area at crest of principal spillway	36.1
Surface area at low stage inlet (normal pool)	13.0
e. Storage Capacity (acre-feet)(1)	
Top of dam	899
Auxiliary spillway crest	567
Principal spillway crest	193
f. Dam	
Type	Earth embankment
Length	870 feet
Height	33 feet
Top width	14 feet
Side slopes	Downstream: 2.5H:1V Upstream: 3H:1V
Zoning	No
Impervious core	No
Cutoff	Yes
Grout curtain	No
g. Primary Spillway	
Type	Drop Inlet
Length	18 feet (total weir length)
Crest Elevation	1197.8
h. Emergency Spillway	
Type	Two trapezoidal earth channels
Length	100 feet each
Crest elevation	1206.0

(1) Storage capacity above normal pool level.

i. Reservoir Drain

Type	12-inch corrugated metal pipe
Length	20 feet
Access	Through riser
Regulating Facility	Sluice gate

SECTION 2: ENGINEERING DATA

2.1 DATA AVAILABLE

Available information was obtained from New York State Department of Environmental Conservation, Dam Safety Division files, and from the files of the SCS in Syracuse, New York. Available information includes design and as-built drawings, engineering reports, and dam inspection reports by the SCS.

2.2 GEOLOGY

The dam at Site 9-C is located in the glaciated Allegheny Plateau section of the Appalachian Plateau Province. A regional geology map is included in Appendix F. This region is characterized as a maturely dissected plateau with the topographic features modified by continental glaciation, including deposition of glacial till in the valleys.

The dam site is located near the axis of a northeast trending anticline (approximately north 70 degrees east). The folding is gentle with the maximum dip of the limbs being one to two degrees. The dip of the strata are affected locally by the folding; however, regionally, the rock strata dip south to southwest at approximately 100 to 150 feet per mile. The most prominent fracture orientations in the region have a strike of north 10 degrees west and are nearly vertical. A secondary fracture trace strikes north 60 to 65 degrees east and is vertical. Less prominent fractures strike north 75 to 80 degrees west and north 15 degrees east. A prominent north 85 degrees west linear trends through the dam.

The rock strata in the area consist of unconsolidated Pleistocene glacial till (Binghamton Drift) underlain by strata of the Sonyea Group (Upper Devonian Age). The glacial till consists of a mixture of clay and silt with varying quantities of gravel. The glacial till is relatively thin on hilltops and slopes and thicker in the valleys. The glacial till in the valley is greater than 50 feet thick. The bedrock consists of a thick sequence of interbedded gray calcareous shale, gray and greenish-gray siltstone and silty shale, brown, gray, and dark gray shale, and black fissile shale.

The abutment slopes are relatively gentle and not susceptible to landslide slope movement.

2.3 SUBSURFACE INVESTIGATION

A subsurface investigation was conducted by the SCS in 1966. This program consisted of 19 borings and numerous test pits. The location of the borings and test pits are shown in Plate 2. The boring logs are included in Plate 3.

In general, the soils in the vicinity of the dam were classified as brown-gray mottled glacial till consisting of silty gravel, clayey gravels, and sandy silts.

2.4 EMBANKMENT AND APPURTENANT STRUCTURES

Plate 2 and Plates 4 through 7 show the plan, section and details of the dam and appurtenant structures. The dam is a homogenous embankment with a central trapezoidal cutoff trench. A trench type internal drainage system was provided beneath the downstream slope, parallel to the embankment center line. The drainage system discharges into the primary spillway impact basin.

The dam was designed to have a 2.5 horizontal to 1 vertical slope on the downstream face, and a 3 horizontal to 1 vertical slope on the upstream face with a crest width of 15 feet. A berm was provided on the upstream slope near normal pool level.

Available hydrology and hydraulic data consist of the SCS hydrology and hydraulic calculations. The calculations are available in SCS files.

2.5 CONSTRUCTION RECORDS

The dam was constructed under the supervision of the SCS. Complete construction records are available in SCS files. No major post-construction changes were instituted.

2.6 OPERATING RECORDS

Because the dam is an ungaged flood retarding structure, no operating records are maintained for the dam. During severe weather conditions, the dam is monitored by the SCS and Broome County personnel.

2.7 EVALUATION OF DATA

The information obtained from the state and SCS files is considered to be adequate for Phase I inspection purposes.

SECTION 3: VISUAL INSPECTION

3.1 FINDINGS

a. General

Visual inspections of the dam were conducted on March 25 and June 3, 1981. On both dates, the pool level was approximately at the invert level of the rectangular orifice located on the upstream face of the riser.

b. Embankment

No signs of distress, seepage, or misalignment were observed. The faces of the dam and the crest are covered with grass and found to be adequately maintained. The top of the dam was surveyed relative to the emergency spillway crest elevation and found to be in the range of 0.1 to 1.0 foot above the design level (El. 1211.3).

c. Primary Spillway

The primary spillway facilities consist of a concrete drop inlet structure discharging into a 36-inch reinforced concrete pipe with antiseepage collars and terminating at an impact basin at the downstream toe. Components of the primary spillway were found to be in satisfactory condition.

d. Emergency Spillway

The emergency spillways consist of two trapezoidal vegetated earth channels, one on each abutment. Both spillways were found to be in good condition. The grass cover is well established and adequately maintained. The approach and discharge channels were found to be free of brush and trees or debris which may pose a potential for blockage of the spillways.

e. Reservoir Drain

The reservoir drain facilities consist of a 12-inch-diameter corrugated metal pipe, extending from the upstream toe to the primary spillway riser. Flow through the pipe is controlled by a manually operated sluice gate located in the primary spillway riser. The system is reported to be operational, but its operation was not observed.

f. Downstream Channel

The downstream channel below the primary spillway concrete impact basin is the natural stream bed. The channel appears to be stable in the near vicinity of the dam.

g. Reservoir

There are no visible signs of instability or sedimentation problems within the reservoir area.

3.2 EVALUATION

The dam was found to be in good condition. At this time, no conditions were observed that would require remedial action.

SECTION 4: OPERATION AND MAINTENANCE PROCEDURES

4.1 PROCEDURES

The reservoir is normally maintained at the crest of the rectangular orifice inlet with excess inflow discharging through the primary spillway riser. The dam is a flood retarding structure and has no formal operating procedure.

4.2 MAINTENANCE OF THE DAM

The dam is maintained by Broome County Soil and Water Conservation District and the maintenance condition of the dam is considered to be satisfactory.

4.3 WARNING SYSTEM IN EFFECT

No formal warning system exists for the dam.

4.4 EVALUATION

The maintenance condition of the dam is considered to be good. Development of a formal warning system is considered to be advisable. It is reported by the SCS, Broome County office, that such a plan is in progress.

SECTION 5: HYDRAULIC/HYDROLOGY

5.1 DRAINAGE AREA CHARACTERISTICS

Nanticoke Creek Watershed Project - Floodwater Retarding Dam Site 9-C has a watershed of 4.36 square miles. The drainage area is comprised of woodlands and farmlands. Relief ranges from moderate to steep.

5.2 ANALYSIS CRITERIA

The PMF inflow hydrograph for the reservoir was determined using the Dam Safety Version of the HEC-1 computer program developed by the Hydrologic Engineering Center of the U.S. Army Corps of Engineers. The data used for the computer input are presented in Appendix D.

5.3 SPILLWAY CAPACITY

The spillway facilities for the dam consist of a primary and two emergency spillways. The emergency spillways are trapezoidal earth channels with a base width of 100 feet. Based on the available head relative to the top of the dam, the combined capacity of the primary and emergency spillways is calculated to be 8474 cfs. The rating calculations for the primary and emergency spillways are included in Appendix D.

5.4 RESERVOIR CAPACITY

The dam impounds a reservoir with a storage capacity of 193 acre-feet at the primary spillway crest level (Elevation 1197.8), 567 acre-feet at emergency spillway crest level (Elevation 1206.0), and 899 acre-feet at the top of the dam (Elevation 1211.3).

5.5 FLOODS OF RECORD

No data available.

5.6 OVERTOPPING POTENTIAL

The PMF inflow hydrograph was determined according to the recommended procedure and was found to have a peak flow of 8789 cfs. The hydrograph was routed through the reservoir and the dam was found to pass full PMF with the reservoir at Elevation 1211.36, which is slightly above the dam crest level at Elevation 1211.30.

5.7 EVALUATION

The spillway can pass the recommended spillway design flood of full PMF with minor overtopping of the embankment; therefore, the spillway capacity is classified to be adequate according to the recommended criteria.

SECTION 6: STRUCTURAL STABILITY

6.1 EVALUATION OF STRUCTURAL STABILITY

a. Visual Observations

As discussed in Section 3, the field observations did not reveal any signs of distress that would significantly affect the stability of the dam at this time. However, it should be understood that because the dam is a flood control facility and was at normal low pool level at the time of inspection, it was not under maximum loading conditions which would occur only during the passage of major floods.

b. Design and Construction Data

The dam was designed based on geological and geotechnical studies including a subsurface investigation, laboratory materials testing and engineering analysis. A SCS memorandum dated March 10, 1965 is included in Appendix G, which summarizes the findings and results of the design investigation.

The stability analysis was performed using the Swedish Circle Method. The parameters used were: internal friction angle, 22 degrees; cohesion, 230 pounds per square foot; saturated and submerged unit weights of 138 and 75 pounds per cubic foot, respectively.

The factors of safety were reported to be 1.53 for the 3 horizontal to 1 vertical upstream slope under rapid drawdown conditions and 1.56 for the 2.5 horizontal to 1 vertical downstream slope under steady state seepage conditions. The available information was reviewed and found to be adequate.

The calculated factors of safety for this dam are in excess of the minimum factor of safety recommended by the Corps of Engineers. The dam is, therefore, considered to have an adequate safety factor for stability.

c. Postconstruction Changes

None reported.

d. Seismic Stability

The dam is located in Seismic Zone 1. Based on the recommended criteria for evaluation of seismic stability of dams, the structure is presumed to present no hazard from earthquakes.

SECTION 7: ASSESSMENT/RECOMMENDATIONS

7.1 ASSESSMENT

a. Safety

Visual observations indicate that Nanticoke Creek Watershed Project - Floodwater Retarding Dam Site 9-C is in good condition. No conditions were observed that would significantly affect the overall performance of the structure at this time. However, as previously noted, the dam was not inspected under its maximum loading condition which would occur when the reservoir is filled during major storms.

The spillway capacity was evaluated according to the recommended procedure and was found to pass the required spillway design flood of full PMF with minor overtopping of the embankment; therefore, the spillway capacity is classified to be adequate.

b. Adequacy of Information

Available information, in conjunction with visual observations, is considered to be sufficient to make a Phase I evaluation.

c. Need for Additional Investigations

No additional investigation is considered to be required at this time.

d. Urgency

The action recommended below should be implemented within three months from notification to the owner.

7.2 RECOMMENDATION

1. An emergency action plan should be developed, including a formal warning system to alert the downstream residents in the event of an emergency.

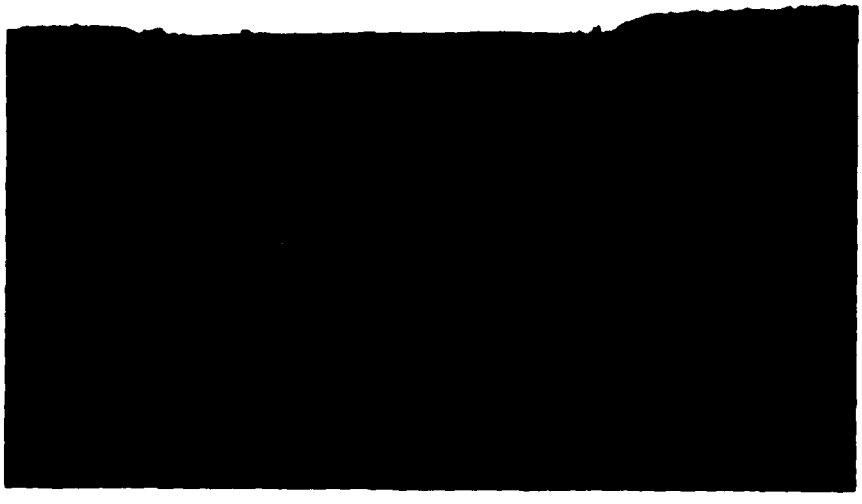
APPENDIX A

PHOTOGRAPHS

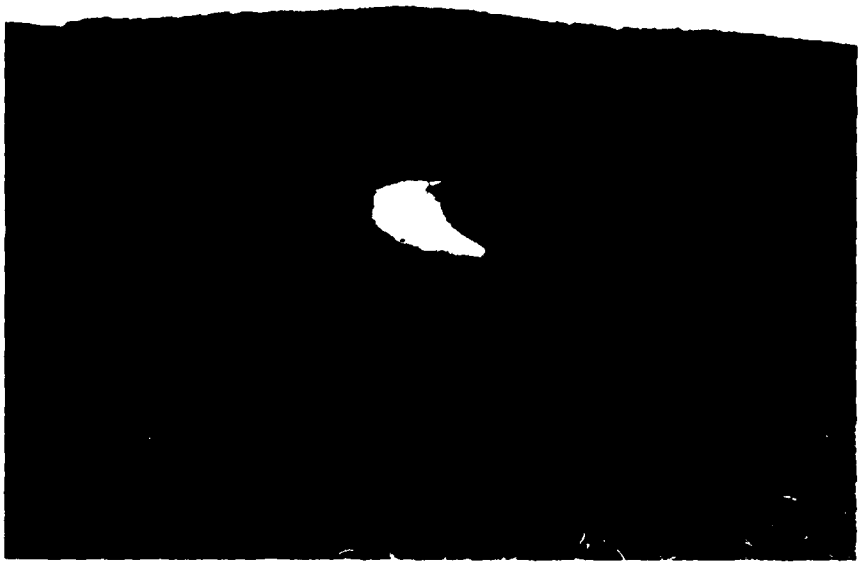
PHOTOGRAPH NO. 1
Dam Crest (looking east)

PHOTOGRAPH NO. 2
Upstream Slope and Left Spillway Approach

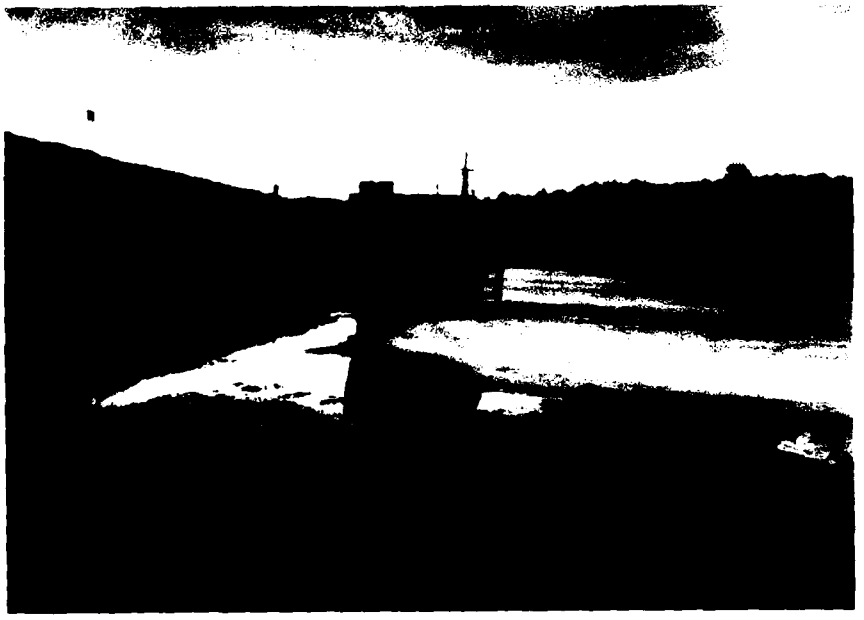
PHOTOGRAPH NO. 3
Emergency Spillway at Left Abutment
(looking west)



PHOTOGRAPH NO. 4
Emergency Spillway at Right Abutment
(looking east)



PHOTOGRAPH NO. 5
Toe of Dam and Discharge Channel
(looking south)



PHOTOGRAPH NO. 6
Primary Spillway Concrete Riser

PHOTOGRAPH NO. 7
Primary Spillway Impact Basin

PHOTOGRAPH NO. 8
One Farm and One Home (2 miles)

APPENDIX B

VISUAL INSPECTION CHECKLIST

APPENDIX B
VISUAL INSPECTION CHECKLIST

1) Basic Data

a. General

Name of Dam Nanticoke Creek Watershed Project - Floodwater Retarding Dam Site 9-C

Fed. I.D. # N.Y. 628 DEC Dam No. 85D-3443

River Basin Susquehanna River Basin

Location: Town Nanticoke

Stream Name Nanticoke Creek

Tributary of Susquehanna River

Latitude (N) 42° 18.4' Longitude (W) 76° 04.8'

Type of Dam Earth

Hazard Category Significant

Date(s) of Inspection March 25, 1981 and June 3, 1981

Weather Conditions Cloudy, Temp. 39 degrees

Reservoir Level at Time of Inspection El. 1190 ±

(USGS Datum)

b. Inspection Personnel Lawrence Andersen, P.E.; James Poellot, P.E.; Bilgin Erel, P.E.; Wah-Tak Chan, P.E.; and Arthur Smith

c. Persons Contacted (Including Address & Phone No.)

Mr. Carl S. Young, Broome County Executive, P.O. Box 1766, Binghamton, N.Y. 13902, (607) 772-2100 and Mr. Gary Page, Broome County, SCS Office, (607) 773-2751

d. History:

Date Constructed June 1967 Date(s) Reconstructed N/A

Designer USDA Soil Conservation Service

Constructed by Aschcraft Excavating Company

Owner Broome County, N.Y.

2) Embankment

a. Characteristics

(1) Embankment Material Earth

(2) Cutoff Type Trapezoidal cutoff trench, 12 feet wide at the base, 6 to 10 feet deep.

(3) Impervious Core None

(4) Internal Drainage System A trench drain equipped with an 8-inch corrugated metal pipe.

(5) Miscellaneous --

b. Crest

(1) Vertical Alignment Good

(2) Horizontal Alignment Good

(3) Surface Cracks None

(4) Miscellaneous --

c. Upstream Slope

(1) Slope (Estimate) 3H:1V (as designed), 2.9H:1V (as measured)

(2) Undesirable Growth or Debris, Animal Burrows None

(3) Sloughing, Subsidence or Depressions None

(4) Slope Protection Vegetated Slope

(5) Surface Cracks or Movement at Toe None

d. Downstream Slope

(1) Slope (Estimate) 2.5H:1V (as designed);
2.5H:1V (as measured)

(2) Undesirable Growth or Debris, Animal Burrows None

(3) Sloughing, Subsidence or Depressions None

(4) Surface Cracks or Movement at Toe None

(5) Seepage None

(6) External Drainage System (Ditches, Trenches, Blanket)
None

(7) Condition Around Outlet Structure Good

(8) Seepage Beyond Toe None

e. Abutments - Embankment Contact

No problems observed.

(1) Erosion at Contact None

(2) Seepage Along Contact None

3) Drainage System

a. Description of System A trench drain equipped with an 8-inch-diameter perforated pipe.

b. Condition of System Only downstream end of the drain pipes are visible.

c. Discharge from Drainage System 1 ± gpm from both drain pipes.

4) Instrumentation (Monumentation/Surveys, Observation Wells, Weirs, Piezometers, etc.)

None

5) Reservoir

a. Slopes Moderate to steep, no problems observed.

b. Sedimentation No problems observed.

c. Unusual Conditions Which Affect Dam None

6) Area Downstream of Dam

a. Downstream Hazard (No. of Homes, Highways, etc.) Village of Nanticoke is located three miles downstream.

b. Seepage, Unusual Growth None

c. Evidence of Movement Beyond Toe of Dam None

d. Condition of Downstream Channel Good

7) Spillway(s) (Including Discharge Conveyance Channel)

In good condition.

a. General Service Spillway: SCS concrete riser discharging into a 36-inch-diameter reinforced concrete pipe. Auxiliary Spillway: Two vegetated earth channels on each abutment.

b. Condition of Service Spillway Good

c. Condition of Auxiliary Spillway Good

d. Condition of Discharge Conveyance Channel Good

8) Reservoir Drain/Outlet

Type: Pipe X Conduit _____ Other _____

Material: Concrete _____ Metal _____ Other Corrugated metal pipe

Size: 12-inch-diameter Length Approximately 30 feet

Invert Elevations: Entrance 1182 Exit 1181.5 (as designed)

Physical Condition (Describe): Not observable.

Material: --

Joints: -- Alignment --

Structural Integrity: --

Hydraulic Capability: --

Means of Control: Gate X Valve _____ Uncontrolled _____

Operation: Operable X Inoperable _____ Other _____

Present Condition (Describe): The reservoir drain pipe is reported to be operable.

9) Structural

a. Concrete Surfaces The concrete riser and the concrete outlet structure appears to be in good condition.

b. Structural Cracking None

c. Movement - Horizontal & Vertical Alignment (Settlement)

No problems observed.

d. Junctions with Abutments or Embankments

No problems observed.

e. Drains - Foundation, Joint, Face

No problems observed.

f. Water Passages, Conduits, Sluices

N/A

g. Seepage or Leakage

No problems observed.

h. Joints - Construction, etc. N/A

i. Foundation No problems observed.

j. Abutments No problems observed.

k. Control Gates Condition unknown.

l. Approach & Outlet Channels Good

m. Energy Dissipators (Plunge Pool, etc.) Good condition.

n. Intake Structures Good

o. Stability N/A

p. Miscellaneous ---

10) Appurtenant Structures (Power House, Lock, Gatehouse, Other)

a. Description and Condition None

APPENDIX C

ENGINEERING DATA CHECKLIST

APPENDIX C
ENGINEERING DATA CHECKLIST
NAME OF DAM: NANTICOKE CREEK WATERSHED PROJECT -
FLOODWATER RETARDING DAM SITE 9-C

AREA-CAPACITY DATA:

	Elevation (feet)	Surface Area (acres)	Storage Capacity[1] (acre-feet)
1) Top of Dam	1211.3	69.7	899
2) Design High Water (Max. Design Pool)	1209.8	65.7	798
3) Auxiliary Spillway Crest	1206.0	55.8	567
4) Primary Spillway Crest	1197.8	36.1	193
5) Crest of Orifice (Normal Pool)	1189.6	13.0	0

[1]Storage capacity below normal pool is not included.

DISCHARGES

	Discharge (cfs)
1) Average Daily	7±
2) Auxiliary Spillway at Maximum High Water (Top of Dam)	8281
3) Auxiliary Spillway at Design High Water	8281±
4) Principal Spillway at Dam Crest Elevation	193
5) Low Level Outlet	20±
6) Total of All Facilities at Maximum High Water	8494
7) Maximum Known Flood	Unknown
8) At Time of Inspection	Approx. 7±

DAM: Nanticoke Creek Watershed Project-Floodwater Retarding Dam Site 9-C

CREST ELEVATION: 1211.3

Type: Earth

Top Width: 14 feet Length: 870 feet

Spillover: Concrete riser and two vegetated earth channels.

Location: Concrete riser near the center of the dam, earth channel on each abutment.

SPILLWAY:

SERVICE		AUXILIARY (Two Units)
Orifice at 1189.6, weir at 1197.8	Elevation	1206.0
SCS concrete drop inlet	Type	Vegetated channel
2'-2" x 2' orifice and 18' weir	Width	100 feet (each unit)
	Type of Control	
Uncontrolled	Uncontrolled	Uncontrolled
	Controlled	
N/A	Type (Flashboards; Gate)	N/A
N/A	Number	N/A
N/A	Size/Length	100 feet
	Invert Material	Vegetated Earth
	Anticipated Length of Operating Service	Unknown
150± feet	Chute Length	N/A
1 foot ± for orifice; 8 feet ± for weir	Height Between Spillway Crest and Approach Channel Invert (Weir Flow)	8± feet

Hydrometerological Gages:

Type: None

Location: N/A

Records:

Date - N/A

Max. Reading - N/A

FLOODWATER CONTROL SYSTEM:

Warning System: None

Method of Controlled Releases (Mechanisms):

None

DRAINAGE AREA: 4.36 square miles

DRAINAGE BASIN RUNOFF CHARACTERISTICS:

Land Use - Type: Wood and farmland

Terrain - Relief: Moderate slope

Surface - Soil: Low permeability soil

Runoff Potential (existing or planned extensive alterations to existing surface or subsurface conditions)

Moderate to high runoff potential (SCS Hydrological Curve No. (CN) 78 was used in the original design calculation).

Potential Sedimentation Problem Areas (natural or man-made; present or future)

None observed.

Potential Backwater Problem Areas for Levels at Maximum Storage Capacity Including Surcharge Storage:

None observed.

Dikes - Floodwalls (overflow and nonoverflow) - Low Reaches Along the Reservoir Perimeter:

Location: None

Elevation:

Reservoir:

Length at Maximum Pool: 3,000 feet; at normal pool 400 feet

Length of Shoreline at Normal Pool: 4,000 feet

APPENDIX D

HYDROLOGY AND HYDRAULIC ANALYSES

HYDROLOGY AND HYDRAULIC ANALYSIS
DATA BASE

NAME OF DAM: Nanticoke Creek Watershed Project-Floodwater Retarding Dam Site 9-C (NY DEC 85D-3443)

PROBABLE MAXIMUM PRECIPITATION (PMP) = 22.2 INCHES/24 HOURS[1]

STATION	1	2	3	4	5
Station Description	9-C Lake	9-C Dam			
Drainage Area (square miles)	4.36				
Cumulative Drainage Area (square miles)	4.36	4.36			
Adjustment of PMF for Drainage Area (%)	94%[2]				
6 Hours	117[2]	-			
12 Hours	127	-			
24 Hours	136	-			
48 Hours	142	-			
72 Hours	145	-			
Snyder Hydrograph Parameters					
C_p, C_t[3]	0.62/1.8	-			
L (miles)[4]	3.28	-			
L_{ca} (miles)[4]	1.55	-			
$t_p = C_t(L \cdot L_{ca})^{0.3}$ (hours)	2.92	-			
Spillway Data					
Crest Length (ft)	-	See spillway capacity rating calculations			
Freeboard (ft)	-				
Discharge Coefficient	-				
Exponent	-				

[1] Hydrometeorological Report 33 (Figure 1), U.S. Army, Corps of Engineers, 1956.

[2] Hydrometeorological Report 40, U. S. Weather Bureau, 1965.

[3] Snyder's Coefficients (C_p and C_t) as recommended by Corps of Engineers, Baltimore District, for Susquehanna River Basin.

[4] L = Length of longest water course from outlet to basin divide.
L_{ca} = Length of water course from outlet to point opposite the centroid of drainage area.

```
**********
FLOOD HYDROGRAPH PACKAGE (HEC-1)
DAM SAFETY VERSION     JULY 1978
  LAST MODIFICATION   01 APR 80
**********
    1                A1       SNYDER UNIT HYDROGRAPH, SPILLWAY AND DAM OVERTOPPING ANALYSES
    2                A2       NANTICOKE 9-C DAM,(NY 850-3443) BROOME COUNTY,N.Y. PROJECT NO. 80-778-06
    3                A3       FOR 20%,30%,40%,50%,60%,70%,80%,90%,AND 100% PROBABLE MAXIMUM FLOOD(PMF)
    4                B    300.       0       15        0        0        0        0        0       -4        0
    5                B1     5
    6                J      1        9        1
    7                J1  0.20     0.30     0.40     0.50     0.60     0.70     0.80     0.90     1.00
    8                K      0        1                                          1
    9                K1       CALC. OF SNYDER INFLOW HYDROGRAPH TO NANTICOKE 9-C DAM, (N.Y. 850-3443)
   10                M      1        1     4.36             4.36                                    1
   11                P              20.9      117      127      136      142      145
   12                T                                                    1.0     0.05             0.0047
   13                W    2.92     0.62
   14                X    -1.5    -0.05      2.0
   15                K      1        2                                          1
   16                K1       ROUTING FLOW THROUGH NANTICOKE 9-C DAM, (N.Y. 850-3443)
   17                Y                                 1        1
   18                Y1     1                                          -1189.6       -1
   19                Y41189.6  1190.0   1191.0   1192.7   1194.0   1197.8   1198.0   1198.5  1199.15   1200.0
   20                Y41202.0  1204.0   1206.0   1206.5   1207.0   1207.5   1208.0   1209.0   1210.0   1211.3
   21                Y5   0.0      1.7      11.1     36.8     43.8     59.7     65.5     94.7    152.0    155.6
   22                Y5 162.9    169.8    176.5    398.5    808.8   1347.5   1994.6   3574.0   5497.7   8473.6
   23                $A  13.0     36.1     55.8     65.7     69.7
   24                $E1189.6  1197.8   1206.0   1209.8   1211.3
   25                $$1197.8
   26                $D1211.3    2.65      1.5    870.0
   27                K     99
```

COMPUTER INPUT OVERTOPPING ANALYSIS

PEAK FLOW AND STORAGE (END OF PERIOD) SUMMARY FOR MULTIPLE PLAN-RATIO ECONOMIC COMPUTATIONS
FLOWS IN CUBIC FEET PER SECOND (CUBIC METERS PER SECOND)
AREA IN SQUARE MILES (SQUARE KILOMETERS)

OPERATION	STATION	AREA	PLAN	RATIOS APPLIED TO FLOWS								
				RATIO 1 .20	RATIO 2 .30	RATIO 3 .40	RATIO 4 .50	RATIO 5 .60	RATIO 6 .70	RATIO 7 .80	RATIO 8 .90	RATIO 9 1.00
HYDROGRAPH AT	1	4.36	1	1758.	2637.	3516.	4395.	5274.	6152.	7031.	7910.	8789.
	(	11.29)	(	49.78)(	74.66)(	99.55)(	124.44)(	149.33)(	174.22)(	199.11)(	223.99)(	248.88)
ROUTED TO	2	4.36	1	919.	2182.	3262.	4241.	5141.	6032.	6902.	7766.	8654.
	(	11.29)	(	26.03)(	61.79)(	92.38)(	120.10)(	145.58)(	170.81)(	195.46)(	219.92)(	245.05)

SUMMARY OF DAM SAFETY ANALYSIS

"PLAN 1 .....

	INITIAL VALUE	SPILLWAY CREST	TOP OF DAM
ELEVATION	1189.60	1197.80	1211.30
STORAGE	0.	193.	899.
OUTFLOW	0.	60.	8474.

RATIO OF PMF	MAXIMUM RESERVOIR W.S.ELEV	MAXIMUM DEPTH OVER DAM	MAXIMUM STORAGE AC-FT	MAXIMUM OUTFLOW CFS	DURATION OVER TOP HOURS	TIME OF MAX OUTFLOW HOURS	TIME OF FAILURE HOURS
.20	1207.10	0.00	630.	919.	0.00	45.50	0.00
.30	1208.12	0.00	691.	2182.	0.00	43.75	0.00
.40	1208.80	0.00	734.	3262.	0.00	43.25	0.00
.50	1209.35	0.00	768.	4241.	0.00	43.00	0.00
.60	1209.81	0.00	799.	5141.	0.00	43.00	0.00
.70	1210.23	0.00	827.	6032.	0.00	43.00	0.00
.80	1210.61	0.00	852.	6902.	0.00	43.00	0.00
.90	1210.99	0.00	878.	7766.	0.00	43.00	0.00
1.00	1211.36	.06	904.	8654.	1.00	42.75	0.00

SPILLWAY CAPACITY RATING

a) SCS RISER { ORIFICE OPENING 2'-2" Wide x 2'-0" High @ EL 1189.6
Weir 9' each side L = 18' @ EL 1197.8

b) EMERGENCY SPILLWAY TWO TRAP. CHANNEL, b = 100', AVG Slope 2.75^H to 1^V @ EL 1206

1) When Water level EL 1189.6 < h < 1197.8

Weir Flow Thru. ORIFICE $Q_1 = C \cdot L \cdot h^{1.5} = (3.1)(2.17)(h)^{1.5}$

$$\boxed{Q_1 = 6.72\, h^{1.5}} \quad \cdots\cdots \text{EQ-1}$$

ORIFICE Flow Thru. ORIFICE $Q_2 = C \cdot A\sqrt{2gh} = (0.6)(2 \times 2.17)(\sqrt{64.4})\sqrt{h}$

$$\boxed{Q_2 = 20.86\sqrt{h}} \quad \cdots\cdots \text{EQ-2}$$

2) When Water level above EL 1197.8 < H < 1206, ADDED CAPACITY.

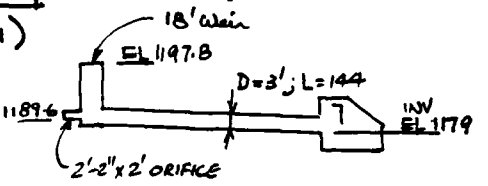
Weir Flow Thru RISER $Q_3 = (3.1)(18)\, H^{1.5}$

$$\boxed{Q_3 = 55.8\, H^{1.5}} \quad \cdots\cdots \text{EQ-3}$$

PIPE FLOW (P.567 DESIGN OF SMALL DAM)

$$H_T = \left[\frac{(2.5204)(1+K_e)}{D^4} + \frac{466.18\, n^2 L}{D^{16/3}}\right]\left(\frac{Q_4}{10}\right)^2$$

$$= \left[\frac{(2.5204)(1.9)}{3^4} + \frac{(466.18)(.0012)^2(144)}{(3)^{16/3}}\right]\left(\frac{Q_4}{10}\right)^2$$

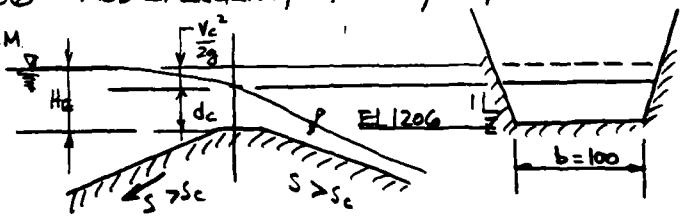


$$\boxed{Q_4 = 33.96\sqrt{H_T}} \quad \cdots \text{EQ-4}$$

3) When Water Level ABOVE EL 1206 ADD EMERGENCY SPILLWAY CAPACITY

REF: P. 553 DESIGN OF SMALL DAM

$$\boxed{V_c = \sqrt{\frac{b + Z d_c}{b + 2Z d_c} d_c g}} \quad \text{EQ-5}$$



$$H_E = d_c + \frac{V_c^2}{2g} = d_c + \frac{b + Z d_c}{b + 2Z d_c}(d_c g)\frac{1}{2g}$$

$$= \frac{(3b + 5Z d_c) d_c}{2b + 4Z d_c}$$

$$\boxed{d_c = \frac{-(3b - 4H_E Z) + \sqrt{(3b - 4H_E Z)^2 + (4H_E Z)(10b)}}{10Z}} \quad \cdots \text{EQ-6}$$

$$\boxed{A_c = (Z d_c + b)\, d_c} \quad \cdots \text{EQ-7}$$

$$\boxed{Q_c = (A_c)(V_c)} \quad \cdots \text{EQ-8} \qquad \boxed{Q_s = 2Q_c = 2A_c V_c} \quad \cdots \text{EQ-9}$$

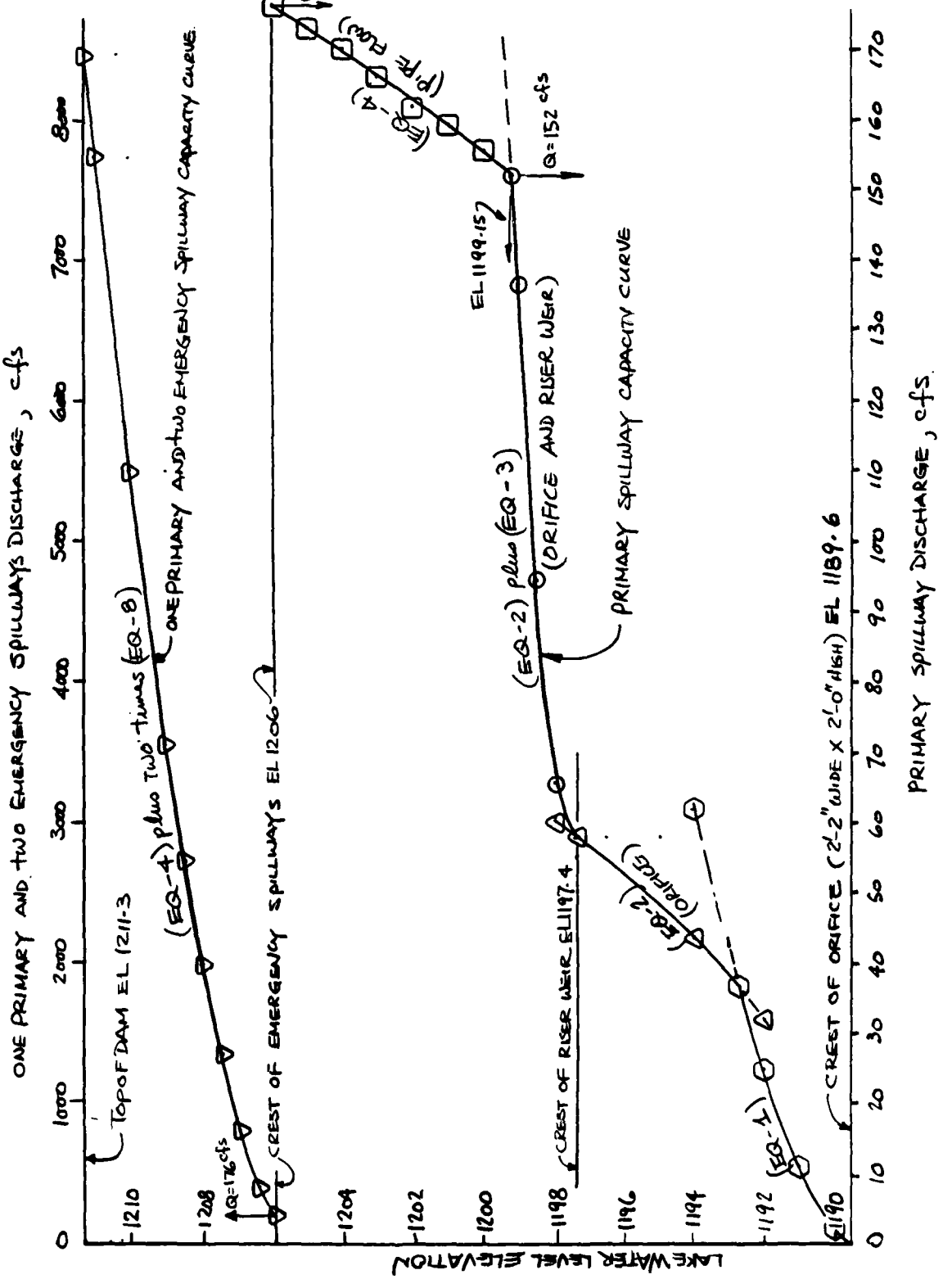
D'APPOLONIA
CONSULTING ENGINEERS, INC.

By WTC Date 6/7/81 Subject NANTICOKE CREEK DAM SITE 9-C Sheet No. 2 of 3
Chkd. By MS Date 6/8/81 HYDRAULIC CALCULATIONS Proj. No. 80-778

LAKE ELEVATION (USGS)	PRIMARY SPILLWAY				PRIMARY SPILLWAY CAPACITY	EMERGENCY SPILLWAY			EM. SPILL. CAPACITY	COMBINED SPILLWAY CAPACITY
	ORIFICE		RISER							
	EQ-1	EQ-2	EQ-3	EQ-4	Qp	EQ-6	EQ-7	EQ-5	EQ-8	
	Q_1	Q_2	Q_3	Q_4	Q_1+Q_2 or Q_4	dc	Ac	Vc	Qc	Q_p+2Q_c
FT	cfs	cfs	cfs	cfs	cfs	FT	FT^2	fps	cfs	cfs
1189.6	0				0					0
1190	1.7	~~13.2~~			1.7					1.7
1190.5	5.7	~~19.8~~			5.7					5.7
1191	11.1	~~24.7~~			11.1					11.1
1192	25.0	~~32.3~~			25.0					25.0
1192.7	36.8	36.8			36.8					36.8
1194	~~62.0~~	43.8			43.8					43.8
1197.4	~~146.3~~	58.3	0		58.3					58.3
1198		60.5	5.0	~~148.0~~	65.5					65.5
1198.5		62.2	32.5	~~150.0~~	94.7					94.7
1199		64.0	73.4	~~151.9~~	137.4					137.4
1199.5		64.5	87.5	~~152.8~~	152.0					152.0
1200		~~67.3~~	~~182.7~~	155.6	155.6					155.6
1201		~~70.4~~	~~319.4~~	159.3	159.3					159.3
1202				162.9	162.9					162.9
1203				166.4	166.4					166.4
1204				169.8	169.8					169.8
1205				173.2	173.2					173.2
1206				176.5	176.5	0	0	0	0	176.5
1206.5				178.1	178.1	0.3	33.7	3.3	110.2	398.5
1207				179.7	179.7	0.7	68.3	4.6	314.6	808.8
1207.5				181.3	181.3	1.0	103.7	5.6	583.1	1347.5
1208				182.9	182.9	1.3	139.9	6.5	905.9	1994.6
1208.5				184.5	184.5	1.7	176.9	7.2	1277.3	2739.1
1209				186.0	186.0	2.0	214.8	7.9	1694.0	3574.0
1210				189.1	189.1	2.7	293.0	9.1	2654.3	5497.7
1211				192.1	192.1	3.4	374.6	10.1	3774.3	7740.7
1211.3				193.0	193.0	3.6	399.7	10.4	4140.3	8473.6

D'APPOLONIA
CONSULTING ENGINEERS, INC.

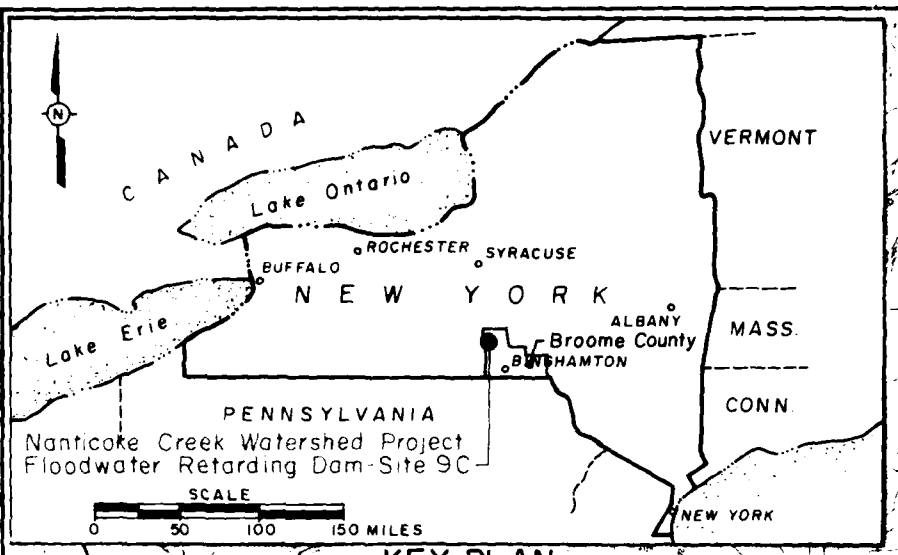
By WTC Date 6/7/81 Subject NANTICOKE CREEK DAMSITE 9C Sheet No. 3 of 3
Chkd. By MB Date 6/8/81 HYDRAULIC CALCULATION Proj. No. 80-778



APPENDIX E

PLATES

DRAWN BY	A.C.S.	CHECKED BY		DRAWING NUMBER 80-778-B27
	6-8-81	APPROVED BY		



KEY PLAN

NANTICOKE CREEK WATERSHED PRO
FLOODWATER RETARDING DAM - SITE

REFERENCES:

U.S.G.S. LISLE, N.Y. QUADRANGLE
DATED: 1949, PHOTOREVISED: 1976, SCALE 1:24000

U.S.G.S. RICHFORD, N.Y. QUADRANGLE
DATED: 1950, SCALE 1:24000

SCALE
0 2000 4000

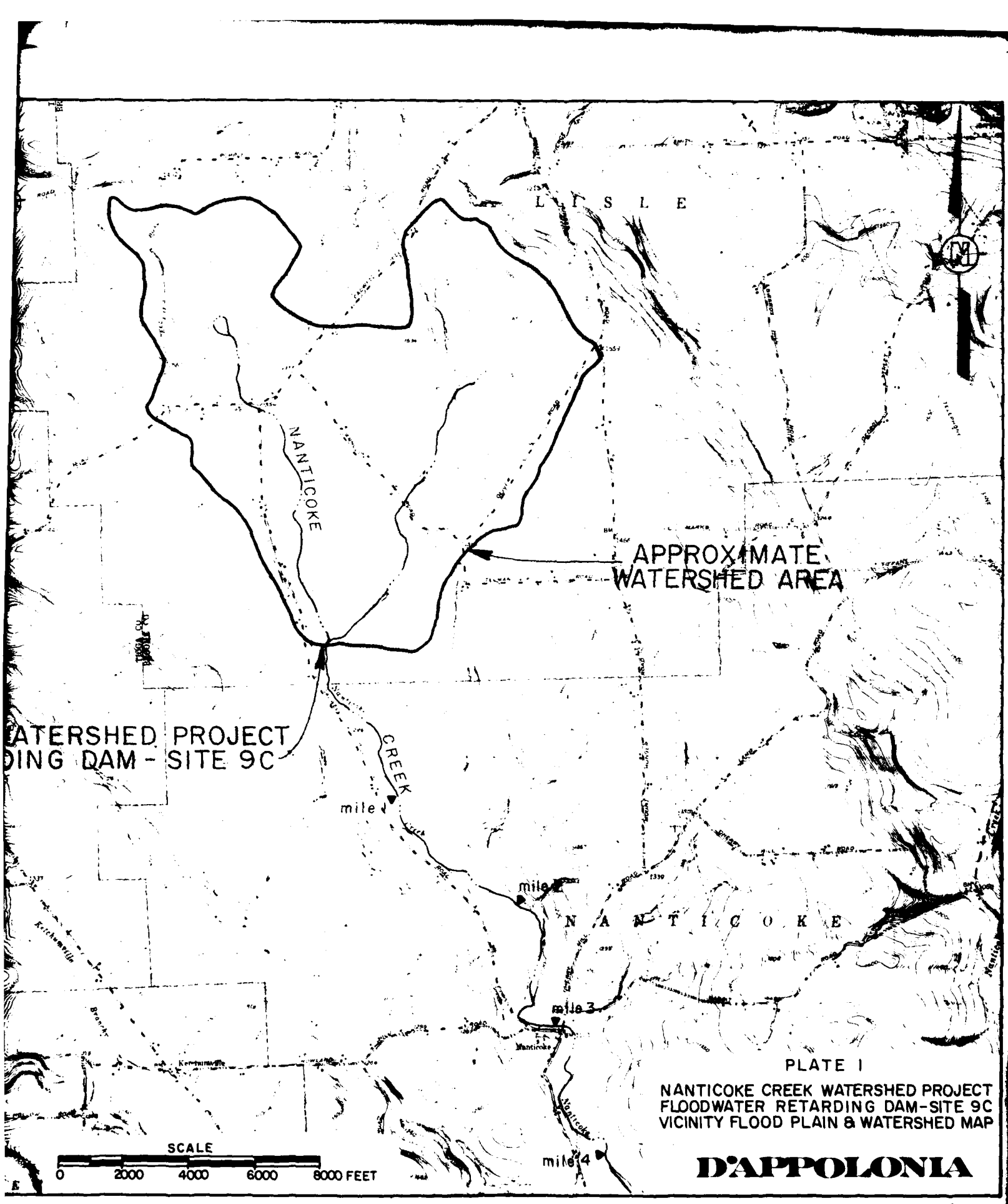


PLATE I

NANTICOKE CREEK WATERSHED PROJECT
FLOODWATER RETARDING DAM-SITE 9C
VICINITY FLOOD PLAIN & WATERSHED MAP

D'APPOLONIA

2

DRAWN BY	G.J.G	CHECKED BY	JE	6/16/81
	5-26-81	APPROVED BY	JHC	6/16/81

DRAWING NUMBER 80-778-B29

LAYOUT DATA - CURVE IV

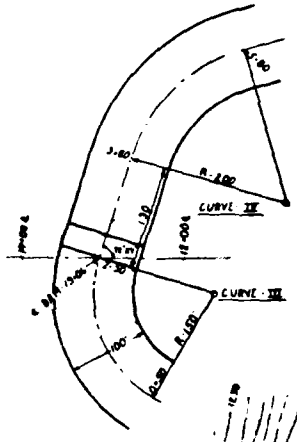
	℄ STATION	DEFLECTION ∠	CHORD DIST	DIST FROM PC
Δ = 57°20	3+80 PC			
R = 200'	4+30	7° 10	49.9	49.9
D = 28° 39	4+80	14° 20	99.0	99.0
L = 200.1	5+30	21° 30	99.9	198.6
T = 109.9	5+80	28° 40	99.9	198.0
E = 28.0				
M = 24.6				

LAYOUT DATA - CURVE V

	℄ STATION	DEFLECTION ∠	CHORD DIST	DIST FROM PC
Δ = 98°06	3+00 PC			
R = 200'	3+50	4°01	49.9	49.9
D = 29°09	4+00	18°02	99.9	99.1
L = 179.9	4+50	18°03	99.9	197.5
T = 91.63	4+95	21°09	24.9	170.9
E = 17.19				
M = 15.95				

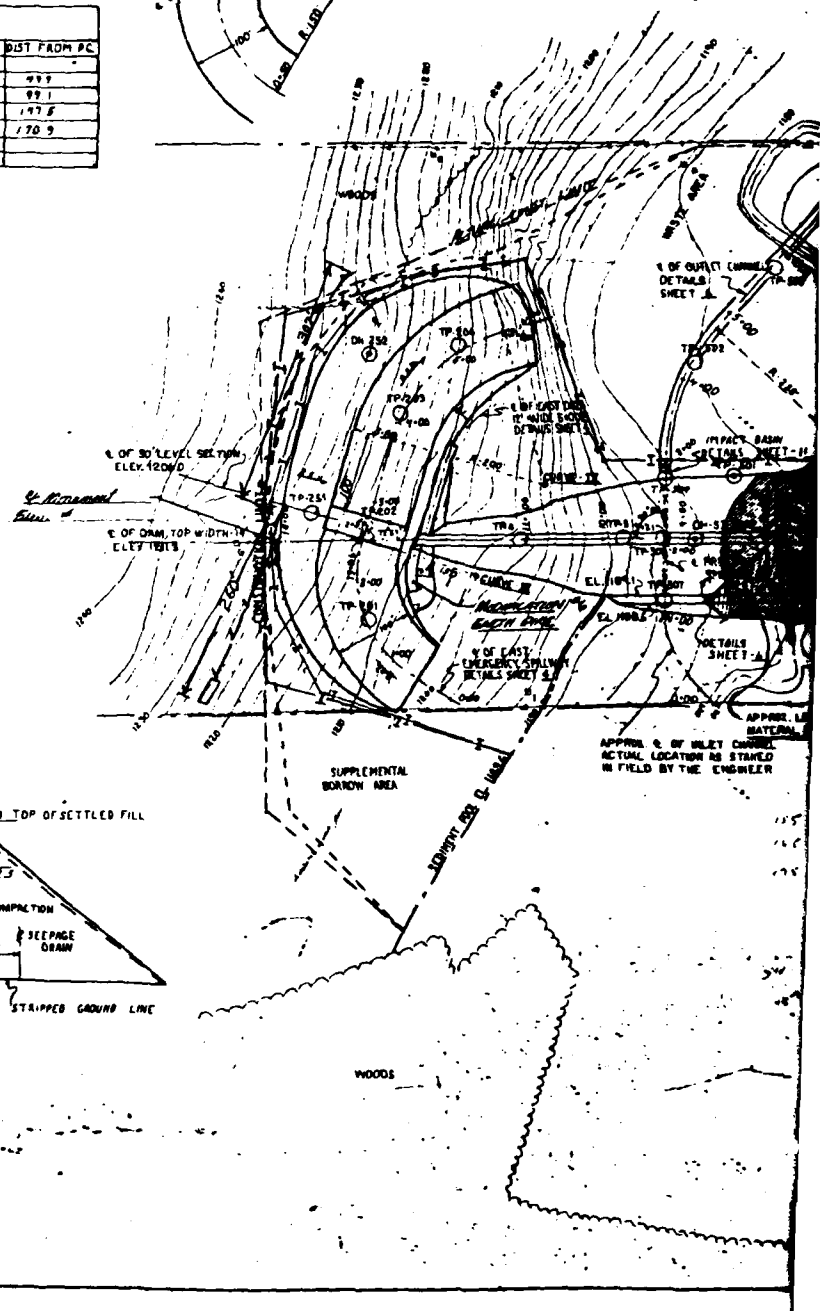
LAYOUT DATA - CURVES I +

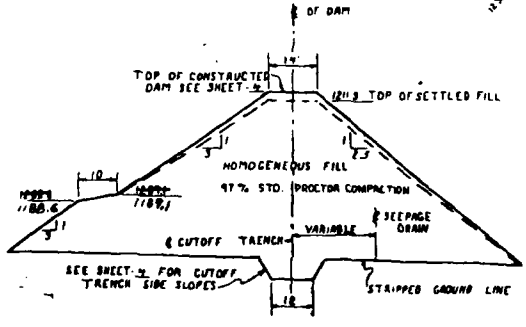
	℄ STATION	DEFLECTION ∠	CHORD D
Δ = 76°24	2+50 PC		
R = 150	2+00	9°53	99.8
D = 38° 12	1+50	19°06	99.8
L = 200'	1+00	28°39	99.8
T = 118.05	0+50	38°12	99.8
E = 40.80			
M = 32.18			



LEGEND

- SEDIMENT POOL
- ℄ OF STREAM
- FENCELINE
- CONTOUR LINES
- PROPERTY LINES (APPROX.)
- CONSTRUCTION LIMIT
- WOODS LINE
- TRAVERSE LINE STATIONS
- BUILDINGS
- TEST HOLES DRILLED
- TEST HOLES DUG
- NEW FENCE





TYPICAL SECTION OF DAM

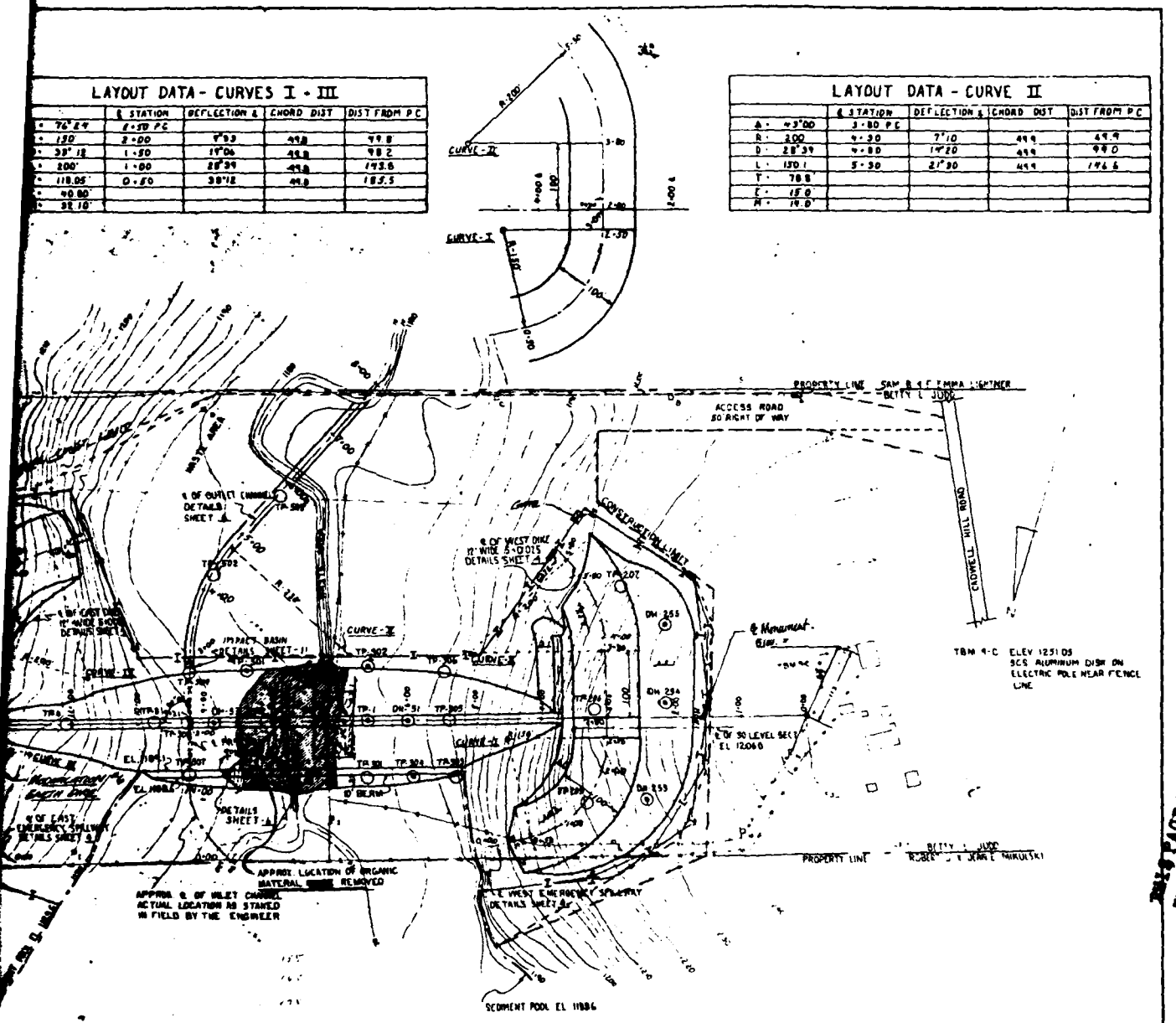
NOT TO SCALE

LAYOUT DATA - CURVES I - III

	℄ STATION	DEFLECTION ∠	CHORD DIST	DIST FROM P.C.
∠ 76°24'	℄ 1+50 P.C.			
∠ 1.50	2+00	1°43	49.8	49.8
∠ 39°18	1+50	19°06	98.2	98.2
∠ 200'	1+00	28°39	193.6	193.6
∠ 118.05'	0+50	38°18	181.5	181.5
∠ 90.00'				
∠ 38.10'				

LAYOUT DATA - CURVE II

	℄ STATION	DEFLECTION ∠	CHORD DIST	DIST FROM P.C.
Δ = 43°00	3+80 P.C.			
R = 200	4+30	7°10	49.9	49.9
D = 28°39	4+80	14°20	99.0	99.0
L = 150.1	5+30	21°30	149.1	196.6
T = 78.8				
E = 15.0				
M = 14.0				



SCALE

NANTICOKE CREEK WATERSHED PROJECT
SITE 9-C
FLOODWATER RETARDING DAM
BROOME COUNTY, NEW YORK
DAMSITE

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

J.H. HARRINGTON	11/64	
W. YOLTON	11/64	
J.L. HUER	11/64	
L.R.	5/65	3/14 NY-2008-P

PLATE 2

D'APPOLONIA

DRAWN BY	G.J.G.	CHECKED BY	[illegible]	6/16/81	DRAWING NUMBER 80-778-B 33
	5-26-81	APPROVED BY	[illegible]	6/16/81	

BACKHOE PIT LOGS

TP 1, C/L Elev. 1183.9

0	1	Topsoil
1	3	Silt - quite pure (approx. 15% +200 size) - some weak bedding noted in test pit - mottled brown & gray - moist - slowly permeable - recent alluvium - stiff to very stiff. D.S. 1.2 D (ML)
3	4	Gravel - silty - max. size about 2" - sub-rounded - grayish brown - wet - mod. to high permeability - recent alluvium - dense. (GM)
4	6.5	Silt, sandy (approx. 35% +200 size) - blue gray - saturated - slowly permeable - Binghamton drift (Wisconsin) probably lacustrine - stiff to very stiff. D.S. 1.3 D (ML)
6.5	13	Silt - quite pure (approx. 10% +200 size) (some weak bedding noted in test pit side) brownish gray - saturated - slowly permeable - Binghamton drift (Wisconsin) (lacustrine) stiff to very stiff. D.S. 1.4 D (ML)

TP 2, C/L Elev. 1183.8

0	3	Silt - quite pure (20% +200 size) - brown - dry to moist - slowly permeable - recent alluvium - stiff. (ML)
3	5	Silt - some sand - considerable amount of organic material (buried roots, etc.) blue gray - wet to saturated - slowly permeable - Binghamton drift, Wisconsin (lacustrine) - soft. (ML)
5	6.5	Gravel - quite clean and well graded - max. size about 1" - mostly subrounded - brown - saturated, with heavy seepage - rapidly permeable - probably Wisconsin outwash - medium density. (GW or GP)
6.5	11	Gravel - fairly high % of fines (approx. 40%) typical till texture - grayish brown - saturated - slowly permeable - Wisconsin till (Binghamton drift) very dense - W.L. -4.0 overnight. (GM)

TP 3, C/L Elev. 1190.0

0	1	Topsoil
1	9.5	Gravel - fairly high % of fines (approx. 40%) typical till texture - grayish brown - saturated - slowly permeable - Wisconsin till (Binghamton drift) very dense - very minor seepage in pit overnight. (GM)

TP 4, C/L Elev. 1202.1

0	1	Topsoil
1	10	Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) - very dense. (GM)

TP 201, Emer. Elev. 1212.5

0	1	Topsoil
1	8	Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) - very dense. (GM)

TP 202, Emer. Elev. 1217.2

0	1	Topsoil
1	10	Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) - very dense. D.S. 202.1 D (GM) CL

TP 203, Emer. Elev. 1218.8

0	1	Topsoil
1	12	Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) - very dense. (GM)

TP 204, Emer. Elev. 1218.9

0	1	Topsoil
1	12	Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) - very dense. D.S. 204.1 (GM) CL

TP 205, Emer. Elev. 1220.9

0	1	Topsoil
1	11	Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense - big boulder at 11'. D.S. 205.1 (GM) CL

TP 206, Emer. Elev. 1224.1

0	1	Topsoil
1	13	Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. D.S. 206.1 D (GM) CL or CL-ML

TP 207, Emer. Elev. 1213.9

0	1	Topsoil
1	13	Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. D.S. 207.1 (GM) CL or CL-ML

TP 301, Prin. Elev. 1183.8

0	2.5	Topsoil (chocolate brown flood plain silt)
2.5	4	Gravel, few fines, medium grain - brown - saturated - rapidly permeable - apparently a buried stream channel - fairly loose - heavy seepage. (GW)
4	10	Silt, with some fine sand - some bedding visible in side of pit - gray - saturated - slowly permeable - Binghamton drift (Wisconsin) probably lacustrine, although could be a ponded outwash - soft - (pit dug under water, so rather difficult to log accurately.) (ML)

TP 302, Prin. Elev. 1183.9

0	1	Topsoil
1	3	Silt, nearly pure (approx. 15-20% +200 size) - no structure noted in pit - light brown - moist - slowly permeable - recent alluvium - medium to stiff. D.S. 302.1 D (ML)
3	6.5	Silt, nearly pure - some weak bedding noted - brown & gray mottled - moist to sat. at about 5' - slowly permeable - probably lacustrine deposit associated with Binghamton drift - medium to stiff. D.S. 3C .2 D (ML)
6.5	8.5	Silt with about 20% +200 size - some weak bedding noted - blue gray - slowly permeable - lacustrine - Binghamton - stiff - saturated. D.S. 302.3 D (ML)
8.5	12	Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. (GM)

TP 303, Prin. Elev. 1188.4

0	1	Topsoil
1	12	Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. (GM)

TP 304, Prin. Elev. 1185.1

0	1	Topsoil
1	3.5	Silt, nearly pure - brown & gray mottled - moist - slowly permeable - recent alluvium - medium to stiff. D.S. 304.1 D (ML)
3.5	4.5	Color change of above to a blue gray. D.S. 304.2 D (ML)
4.5	5.5	Gravel - well graded & fairly high % of fines (approx. 40%) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. (GM)
5.5	7.5	Sand, some silt - brownish gray - wet - mod. permeable - Binghamton outwash - stiff. (SM)
7.5	12	Silt, some fine sand (approx. 12% +200) with occasional zones containing fine gravels - brown - sat. - slowly permeable - Binghamton drift - lacustrine - medium to stiff. D.S. 304.3 (ML)

TP 305, Prin. Elev. 1189.6

0	1	Topsoil
1	11.5	Gravel - well graded & fairly h of fines (approx. 40%) - typical texture - grayish brown to brown moist - slowly permeable - Wisc till (Binghamton drift) very d changes at 6.0' to a sandier, till that digs a little easier 10' it becomes quite wet with amount of seepage at bottom of

TP 306, Prin. Elev. 1187.4

0	1	Topsoil
1	12	Gravel - well graded & fairly h of fines (approx. 40%) - typical texture - grayish brown to brown moist - slowly permeable - Wisc till (Binghamton drift) very d changes at 6.0' to a sandier, till that digs a little easier 10' it becomes quite wet with amount of seepage at bottom of

TP 307, Prin. Elev. 1185.7

0	1	Topsoil
1	7	Gravel - well graded & fairly h of fines (approx. 40%) - typical texture - grayish brown to brown moist - slowly permeable - Wisc till (Binghamton drift) very d

TP 308, Prin. Elev. 1185.9

0	1	Topsoil
1	7	Gravel - well graded & fairly h of fines (approx. 40%) - typical texture - grayish brown to brown moist - slowly permeable - Wisc till (Binghamton drift) very d

TP 309, Prin. Elev. 1184.7

0	1	Topsoil
1	7	Gravel - well graded & fairly h of fines (approx. 40% - typical texture - grayish brown to brown moist - slowly permeable - Wisc till (Binghamton drift) very d

TP 501, D.S. Two, Elev. 1183.6

0	1	Topsoil
1	3	Silt - quite pure - brown - m slowly permeable - recent all soft.
3	6	Gravel - medium grain - quite gray - saturated w/seepage - permeable - buried stream chan loose - water level at -4.5 D.S. 501.1
6	10	Gravel - well graded & fairly of fines (approx. 40% - typical texture - grayish brown to brown moist - slowly permeable - Wisc till (Binghamton drift) very d

TP 502, Exit Channel, Elev. 1188.9

0	1	Topsoil
1	5	Silt - mottled brown & gray - slowly permeable - recent all stiff to very stiff.
5	7	Silt - some trace of organic wet to saturated - slowly pe Binghamton drift - lacustrin outwash - soft.

TP 503, Exit Channel, Elev. 1181.7

0	2	Topsoil & chocolate brown fl
2	6	Silt - some trace of organic wet to saturated - slowly pe Binghamton drift - lacustrin outwash - soft.

TP 305, Prin. Elev. 1159.5

0	1	Topsoil
1	11.5	Gravel - well graded & fairly high $ of fines (approx. 10$) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense - changes at 4.5' to a sandier, wetter till that digs a little easier - at 10' it becomes quite wet with a minor amount of seepage at bottom of pit. (GM)

TP 306, Prin. Elev. 1157.4

0	1	Topsoil
1	12	Gravel - well graded & fairly high $ of fines (approx. 10$) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense - changes at 4.0' to a sandier, wetter till that digs a little easier - at 10' it becomes quite wet with a minor amount of seepage at bottom of pit. (GM)

TP 307, Prin. Elev. 1156.7

0	1	Topsoil
1	7	Gravel - well graded & fairly high $ of fines (approx. 10$) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. (GM)

TP 308, Prin. Elev. 1156.0

0	1	Topsoil
1	7	Gravel - well graded & fairly high $ of fines (approx. 10$) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. (GM)

TP 309, Prin. Elev. 1154.7

0	1	Topsoil
1	7	Gravel - well graded & fairly high $ of fines (approx. 10$) - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. (GM)

TP 501, D.S. Twn, Elev. 1183.6

0	1	Topsoil
1	3	Silt - quite pure - brown - moist - slowly permeable - recent alluvium - soft. (ML)
3	6	Gravel - medium grain - quite clean - gray - saturated w/seepage - rapidly permeable - buried stream channel - loose - water level at -4.5 overnight. D.S. 501.1 (GW)
6	10	Gravel - well graded & fairly high $ of fines (approx. 10$ - typical till texture - grayish brown to brown - moist - slowly permeable - Wisconsin till (Binghamton drift) very dense. (GM)

TP 502, Exit Channel, Elev. 1188.9

0	1	Topsoil
1	5	Silt - mottled brown & gray - moist - slowly permeable - recent alluvium - stiff to very stiff. (ML)
5	7	Silt - some trace of organic - blue gray - wet to saturated - slowly permeable - Binghamton drift - lacustrine or ponded outwash - soft. (ML)

TP 503, Exit Channel, Elev. 1181.7

0	2	Topsoil & chocolate brown flood plain silt.
2	6	Silt - some trace of organic - blue gray - wet to saturated - slowly permeable - Binghamton drift - lacustrine or ponded outwash - soft. (ML)

BORING LOGS

DH 51, C/L Elev. 1185.1

B =

B		
14	0.0	Silt, some fine sand - brown & gray mottled - moist - slowly permeable - stiff to very stiff - recent alluvium.
18		
18	5.0	Silt, sandy pure - blue gray - wet to saturated - slowly permeable - Binghamton drift - alluvium - stiff.
13		
17		
11	9.0	Silt, some small gravels - blue gray - sat. - slowly permeable - Binghamton, lacustrine - stiff.
18		
	10.5	Silt, some sand - brown - sat. - slowly permeable - Binghamton, lacustrine - very stiff.
61		
	13.5	
21		Silt, some sand & small gravels - brown - sat. - slowly permeable - Binghamton, lacustrine.
28		
	17.5	
44		Gravel, well graded & fairly high in fines-typical till texture - grayish brown to brown - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.
47		
	20.0	

DH 52, C/L Elev. 1183.1

B		
6	0.0	Silt, some organic material - gray - wet to sat. - slowly permeable - recent alluvium & Binghamton, lacustrine - medium.
6		
7		
10	5.0	Gravel, sandy - blue gray - sat. - rapidly permeable - buried stream channel - loose.
16		
	6.4	
16		Silt, sandy, occasional stones in lower part of horizon - blue gray grading into brown at about 10' - sat. - slowly permeable - Binghamton, lacustrine - stiff to very stiff.
16		
15		
18		
	12.5	
24		Gravel, well graded & fairly high in fines-typical till texture - grayish brown to brown - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.
24		
123/0.4		
77		
101		
	20.0	

DH 53, C/L Elev. 1185.4

B		
13	0.0	Silt, some sand - brown - moist - slowly permeable - recent alluvium - stiff to very stiff.
28		
	2.6	
36		Gravel, well graded & fairly high in fines-typical till texture - grayish brown to brown - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.
34		
44		
55		
59		
	11.0	
95		Same as above, except sandier.
	12.5	
78		Gravel, well graded & fairly high in fines-typical till texture - gray to brownish gray - sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.
83		
66		
56		
	18.3	
22		Silt, sandy with few small pebbles - brown-sat. - slowly permeable - Binghamton drift (possibly lacustrine) very stiff.
39		
	20.0	

NOTE: Samples 11' to 15': Stone plugged shoe midway in drives & thereby dislocated & compressed the soil for the balance of the drive, therefore, no and short recovery & higher blow counts.

DH 252, Emer. Elev. 1234.2

B		
35	0.0	Gravel, well graded & fairly high in fines-typical texture - brown - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.
52		
38	14.5	
65		
59		Same as above, except sandier.
	19.5	
45		Gravel, well graded & fairly high in fines-typical till texture - brownish gray - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.
23		
103		
86		
	25.0	

DH 253, Emer. Elev. 1235.0

B =

B		
37	0.0	Gravel, well graded & fairly high in fines - typical till texture - brown - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.
57		
32		
33		
	22.0	
86		Gravel, well graded & fairly high in fines - typical till texture - brownish gray - moist to sat. - slowly permeable-Wisconsin till, Binghamton drift - very dense.
34		
	27.0	
20		Probable silty fine sand - too soft & wet to recover - (drillers note).
	28.5	
34		Gravel, well graded & fairly high in fines - typical till texture - brownish gray - moist to sat. - slowly permeable Wisconsin till, Binghamton drift - very dense.
	30.0	

NOTE: Heavy water loss from 27' to 28'. Water level dropped to 24.5 as soon as water poured in at top of casing was stopped.

DH 254, Emer. Elev. 1229.4

B		
49	0.0	Gravel, well graded & fairly high in fines - typical till texture - brown - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.
48		
42		
	16.9	
41		Gravel, well graded & fairly high in fines - typical till texture - brownish gray - moist to sat. - slowly permeable-Wisconsin till, Binghamton drift - very dense.
49		
44		
	25.0	

DH 254, Emer. Elev. 1234.9

B		
49	0.0	Gravel, well graded & fairly high in fines - typical till texture - brown - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.
54		
73		
	16.5	
30		Gravel, well graded & fairly high in fines - typical till texture - brownish gray - moist to sat. - slowly permeable-Wisconsin till, Binghamton drift - very dense.
71		
77		
	30.5	

DH 255, Emer. Elev. 1231.3

B		
54	0.0	Gravel, well graded & fairly high in fines - typical till texture - brown - moist to sat. - slowly permeable - Wisconsin till, Binghamton drift - very dense.
62		
	18.0	
124/0.4 (cobble)		Gravel, well graded & fairly high in fines - typical till texture - brownish gray - moist to sat. - slowly permeable-Wisconsin till, Binghamton drift - very dense.
47		
66		
70		
	30.0	

UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS

GW Well graded gravels; gravel-sand mixtures
GM Silty gravels; gravel-sand-silt mixtures
SM Silty sands; sand-silt mixtures
ML Silts; silty, v. fine sands; sandy or clayey silts

SAMPLES

DS Disturbed

KEY TO DRILL HOLE (DH) LOGS

B = 22 — Number of blows required for 1-ft. standard penetration, using 2.0" O.D. split barrel sampler, 140 lb. hammer, and 30" drop. ASTM D 1586.

9.0 — Depth in hole (ft.)

CL — Unified Soil Classification Symbol

12.0

(1) FIELD UNIFIED CLASSIFICATION BY VISUAL INSPECTION IN NOV. 1964
(2) UNIFIED CLASSIFICATION BY LABORATORY

LOGS OF TEST HOLES

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

INVESTIGATED B.S.E. 11/64
DESIGNED
DRAWN L B 5/65

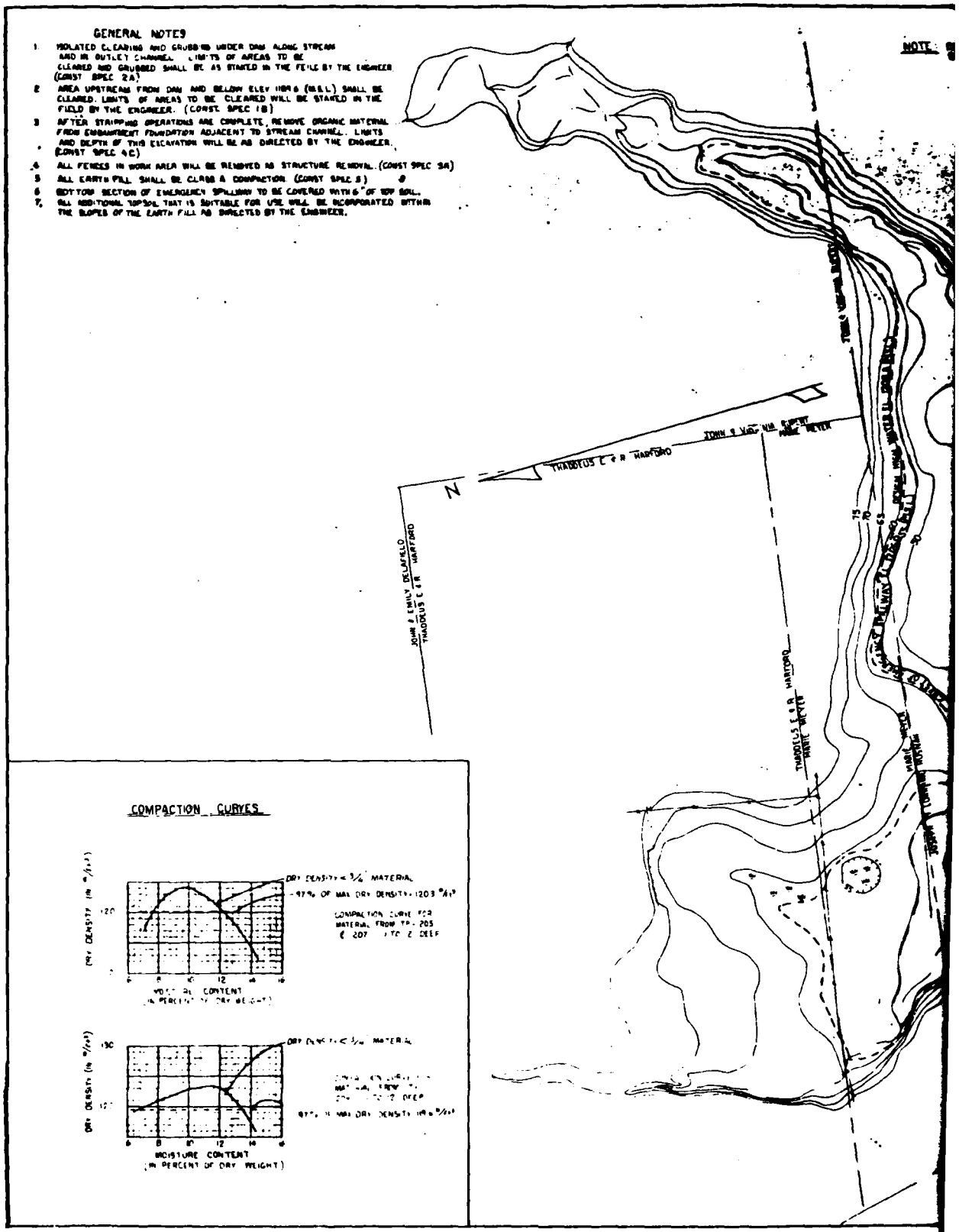
NY-2008-G

PLATE 3

DRAWN BY	G.J.G.	CHECKED BY			DRAWING NUMBER 80-778-B28
	5-26-81	APPROVED BY		6/16/81	

GENERAL NOTES

1. ISOLATED CLEARING AND GRUBBING UNDER DAM ALONG STREAM AND IN OUTLET CHANNEL. LIMITS OF AREAS TO BE CLEARED AND GRUBBED SHALL BE AS STAKED IN THE FIELD BY THE ENGINEER. (CONST SPEC 2A)
2. AREA UPSTREAM FROM DAM AND BELOW ELEV 1084.6 (W.S.L.) SHALL BE CLEARED. LIMITS OF AREAS TO BE CLEARED WILL BE STAKED IN THE FIELD BY THE ENGINEER. (CONST SPEC 1B)
3. AFTER STRIPPING OPERATIONS ARE COMPLETE, REMOVE ORGANIC MATERIAL FROM EMBANKMENT FOUNDATION ADJACENT TO STREAM CHANNEL. LIMITS AND DEPTH OF THIS EXCAVATION WILL BE AS DIRECTED BY THE ENGINEER. (CONST SPEC 4C)
4. ALL FENCES IN WORK AREA WILL BE REMOVED AS STRUCTURE REMOVAL. (CONST SPEC 9A)
5. ALL EARTH FILL SHALL BE CLASS A COMPACTION. (CONST SPEC 8)
6. BOTTOM SECTION OF EMERGENCY SPILLWAY TO BE COVERED WITH 6" OF TOP SOIL.
7. ALL ADDITIONAL TOPSOIL THAT IS SUITABLE FOR USE WILL BE INCORPORATED WITHIN THE SLOPES OF THE EARTH FILL AS DIRECTED BY THE ENGINEER.



COMPACTION CURVES

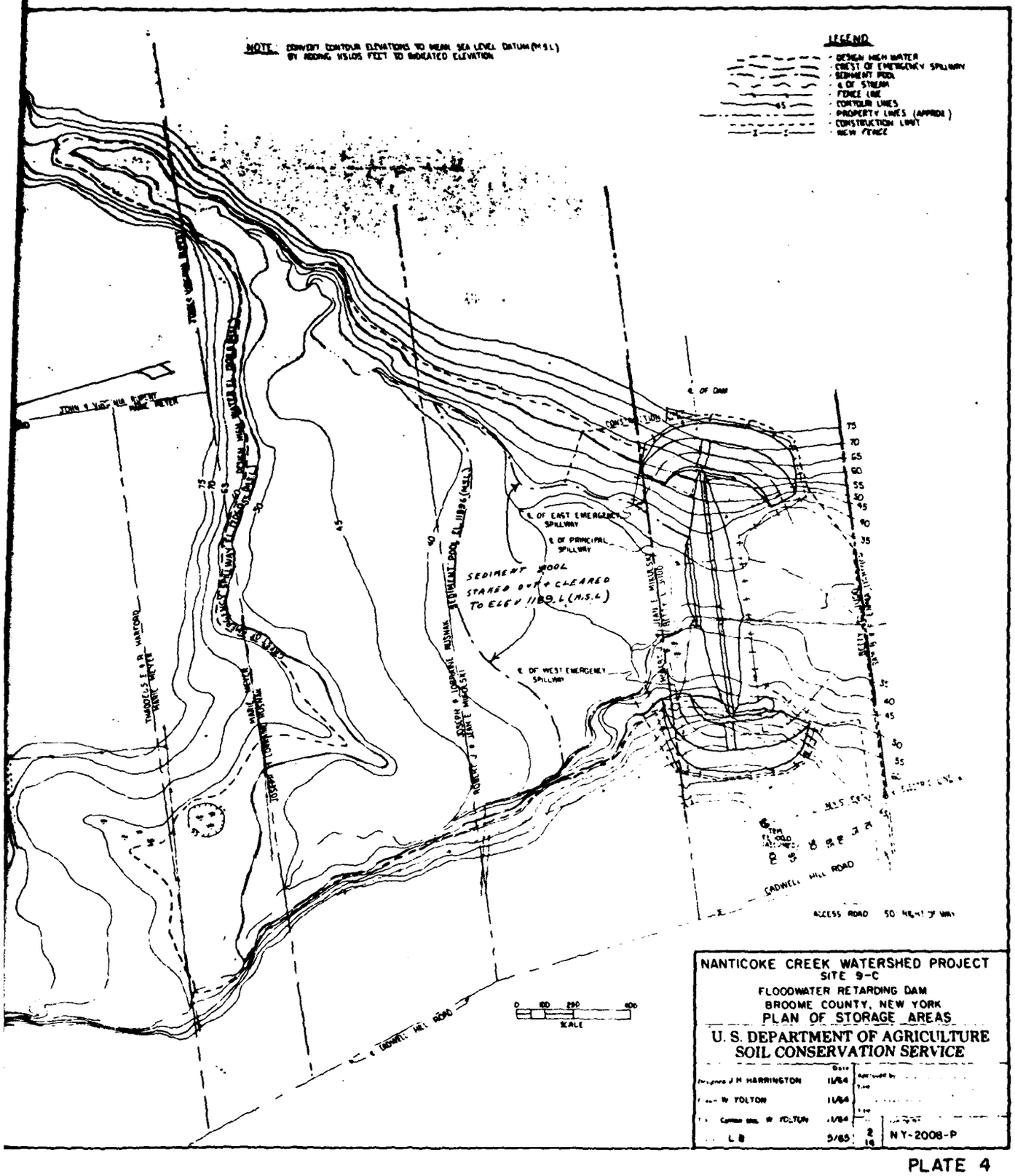


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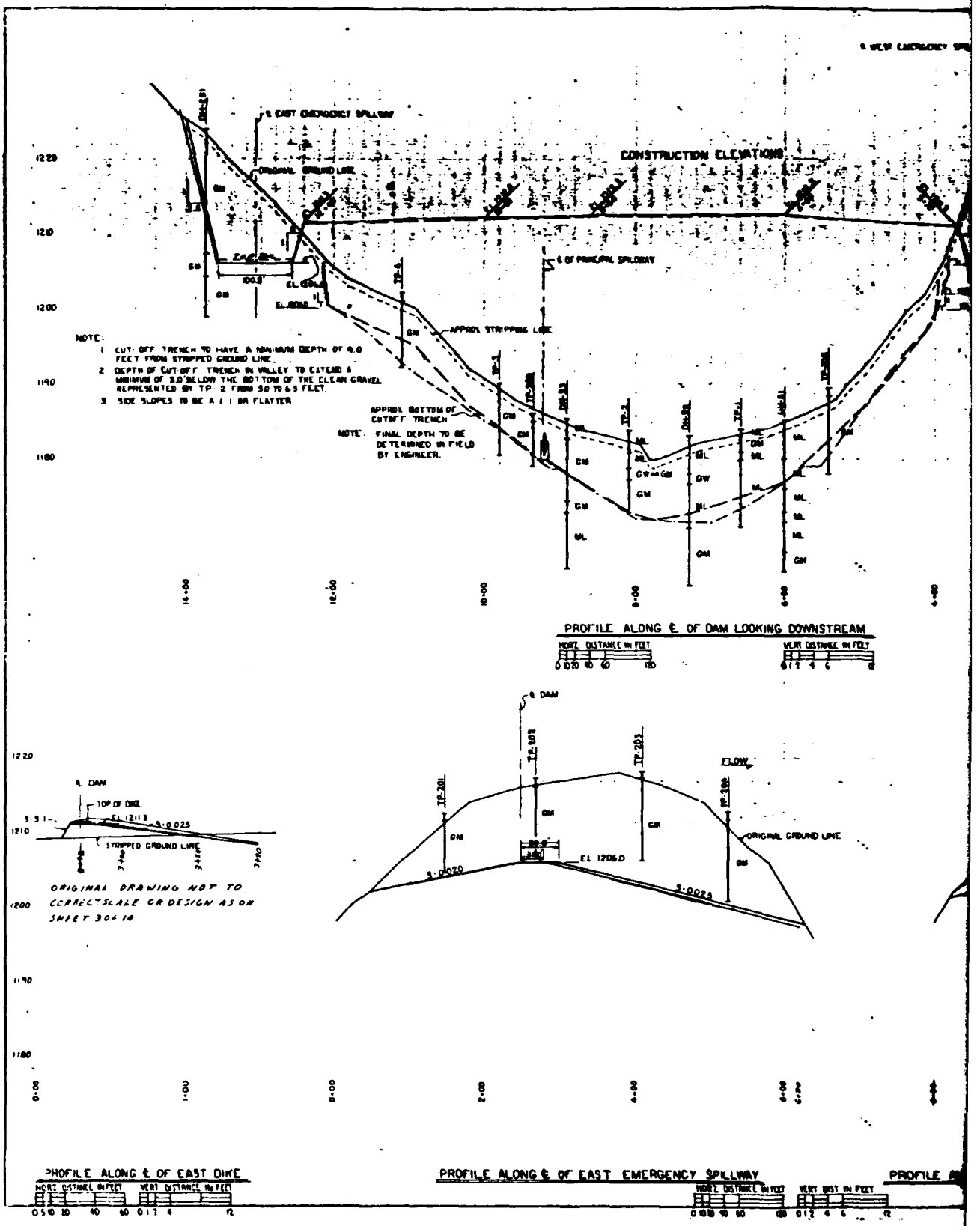
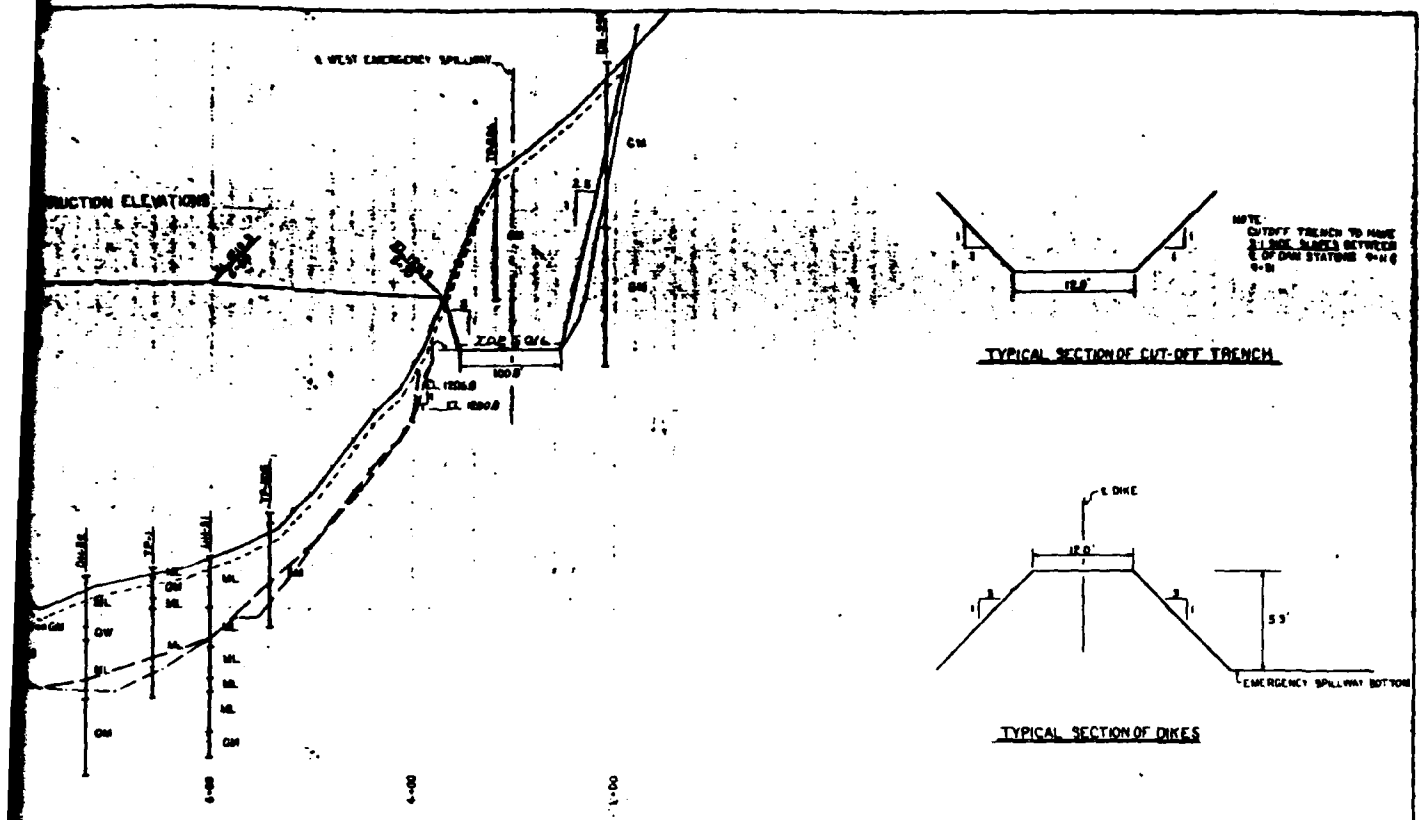
PLATE 4

D'APPOLONIA

DRAWN BY	CHECKED BY	APPROVED BY	DRAWING NUMBER
G.J.G. 5-26-81	6/16/81	6/16/81	80-778-B30





NANTICOKE CREEK WATERSHED PROJECT
SITE 9-C
FLOODWATER RETARDING DAM
BROOME COUNTY, NEW YORK
PROFILES

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

J M HARRINGTON 11/64
L C IBBITSON 4/65
D ANGELO 4/65
LB 5/65

4
14

NY-2008-P

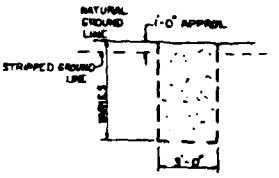
2

PLATE 5

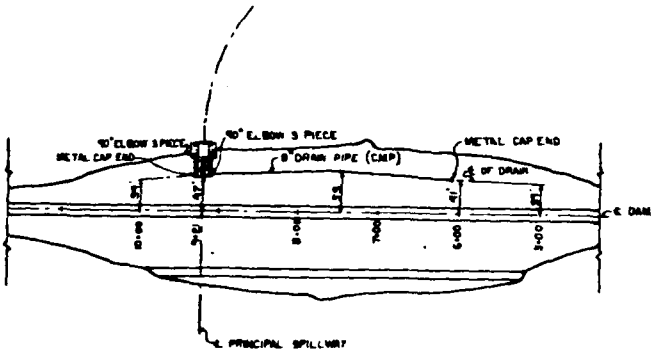
DRAWN BY	G.J.G.	CHECKED BY		4/16/81	DRAWING NUMBER 80-778-B31
	5-26-81	APPROVED BY		6/16/81	

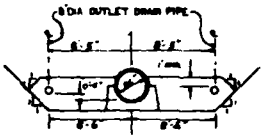
QUANTITY SUMMARY

450 - CU YDS DRAIN FILL
250' - OF 8" DIA C.M.P. 16 GAGE
3 - 90° ELBOWS - 3 PIECE
3 - METAL END CAPS



SECTION C-C, E-E

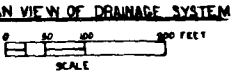


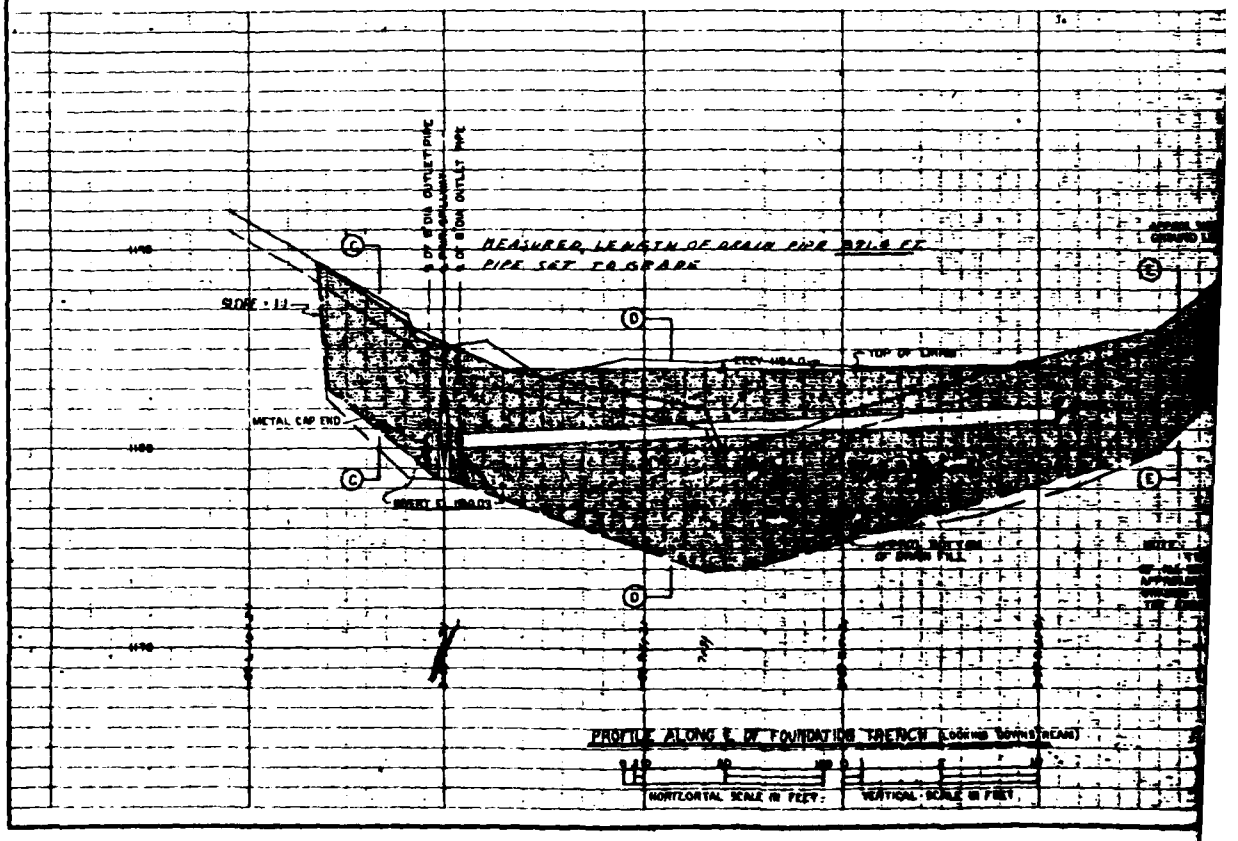


SECTION A-A

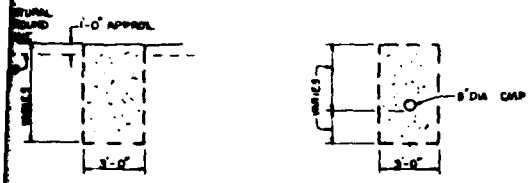
NOTE:
ALL DRAIN PIPE SHALL CONFORM TO MATERIAL SPEC 110 & SHALL BE SHAPE I, CLASS II, TYPE A, PERFORATED PIPE
ALL PIPE SHALL BE LAID WITH PERFORATIONS DOWN

PLAN VIEW OF DRAINAGE SYSTEM



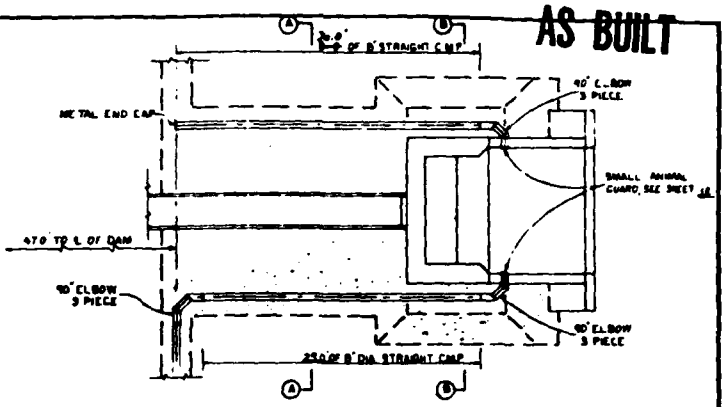


AS BUILT

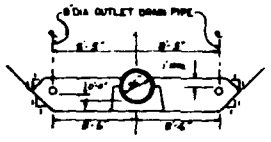


SECTION C-C, E-E

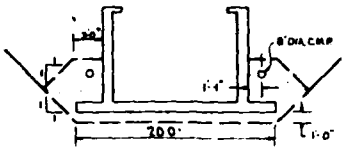
SECTION D-D



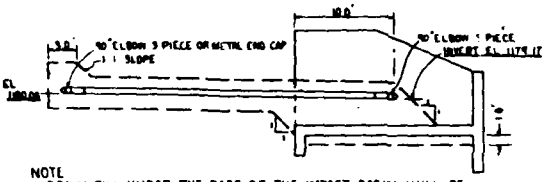
PLAN OF OUTLET DRAIN



SECTION A-A

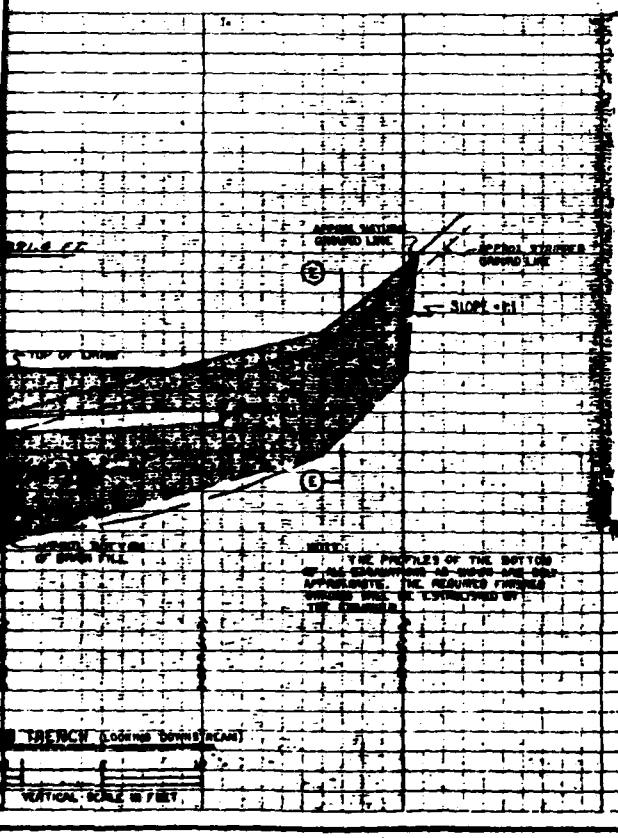


SECTION B-B



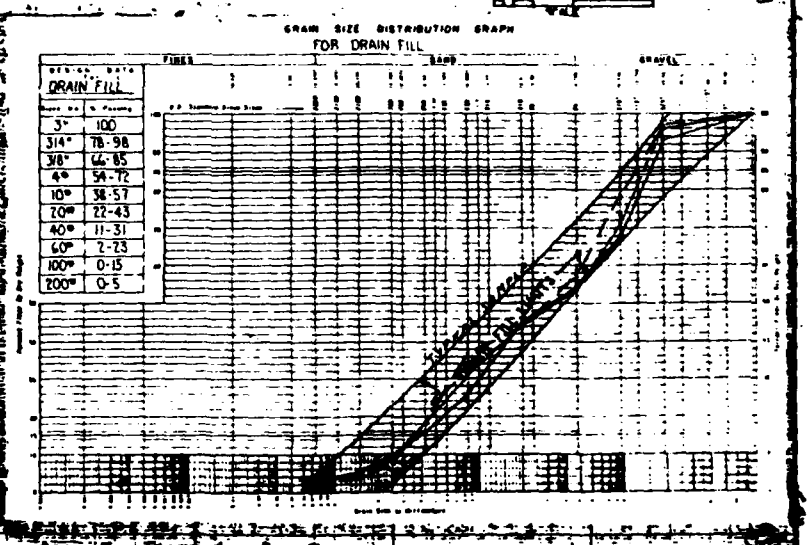
NOTE
DRAIN FILL UNDER THE BASE OF THE IMPACT BASIN WILL BE COMPACTED BY MANUALLY OPERATED COMPACTION EQUIPMENT.

PROFILE ALONG ℄ OF OUTLET DRAIN PIPE



NOTE: THE PROFILES OF THE BOTTOM OF THE EXCAVATED AS SHOWN ARE ONLY APPROXIMATE. THE REQUIRED FINISHED GRADES SHALL BE ESTABLISHED BY THE ENGINEER.

GRAIN SIZE DISTRIBUTION GRAPH
FOR DRAIN FILL



Drain Fine Test - Area Para Terreno

6/7/66

5/19/66

5/2/66

NANTICOKE CREEK WATERSHED PROJECT
SITE 9-C
FLOODWATER RETARDING DAM
BROOME COUNTY, NEW YORK
DRAINAGE SYSTEM DETAILS

U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

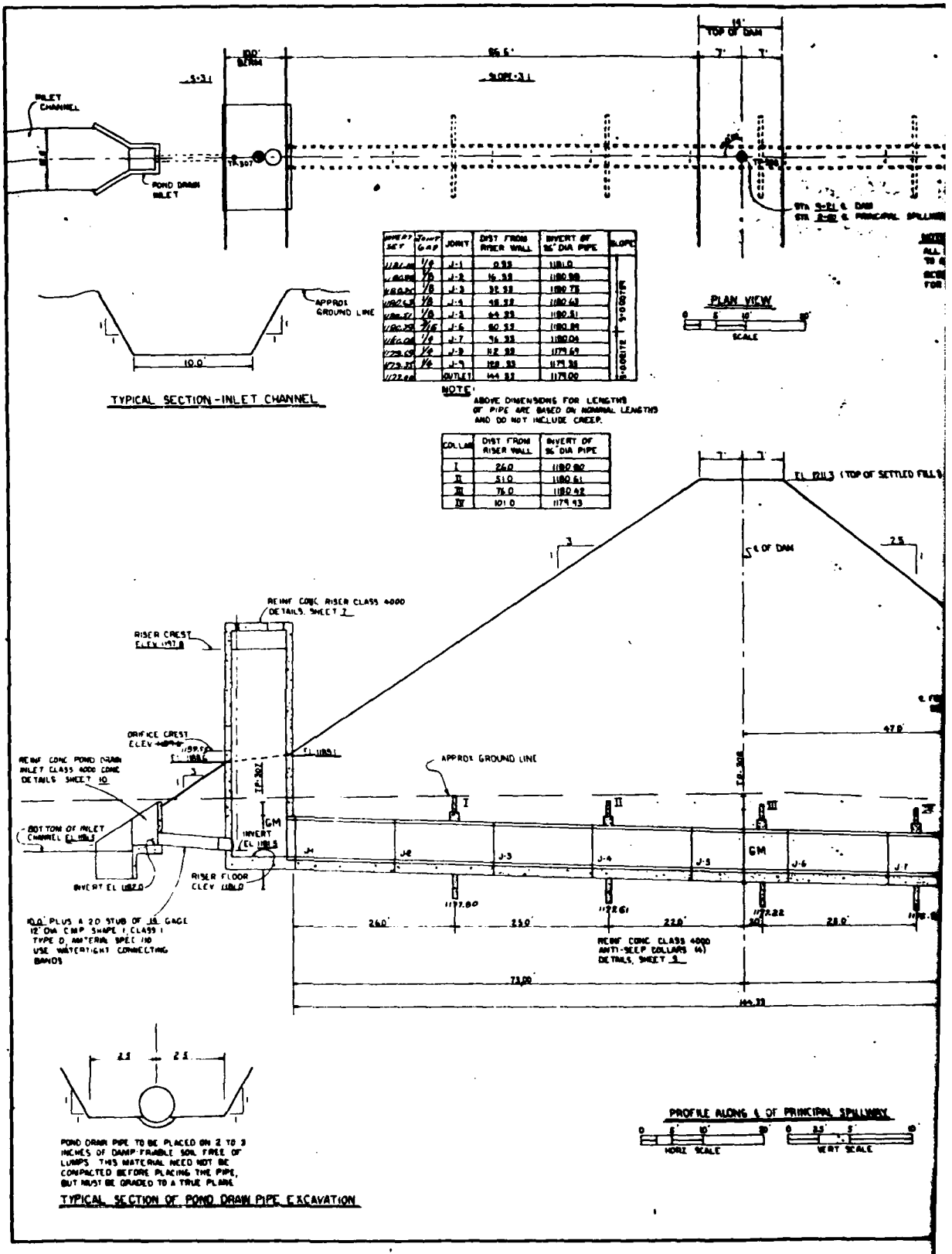
L.C. GIBSON	4/66		
W. YOLTON D. ANGELO	4/66		
L.B.	5/66	3	NY-2008-1

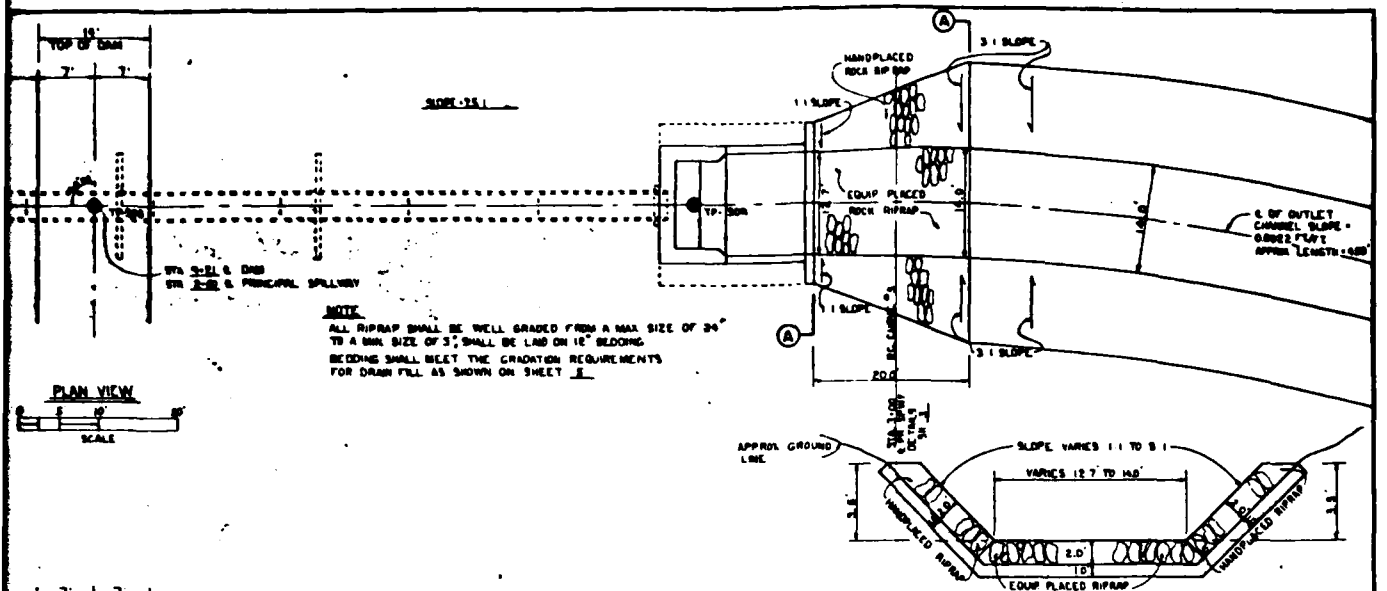
2

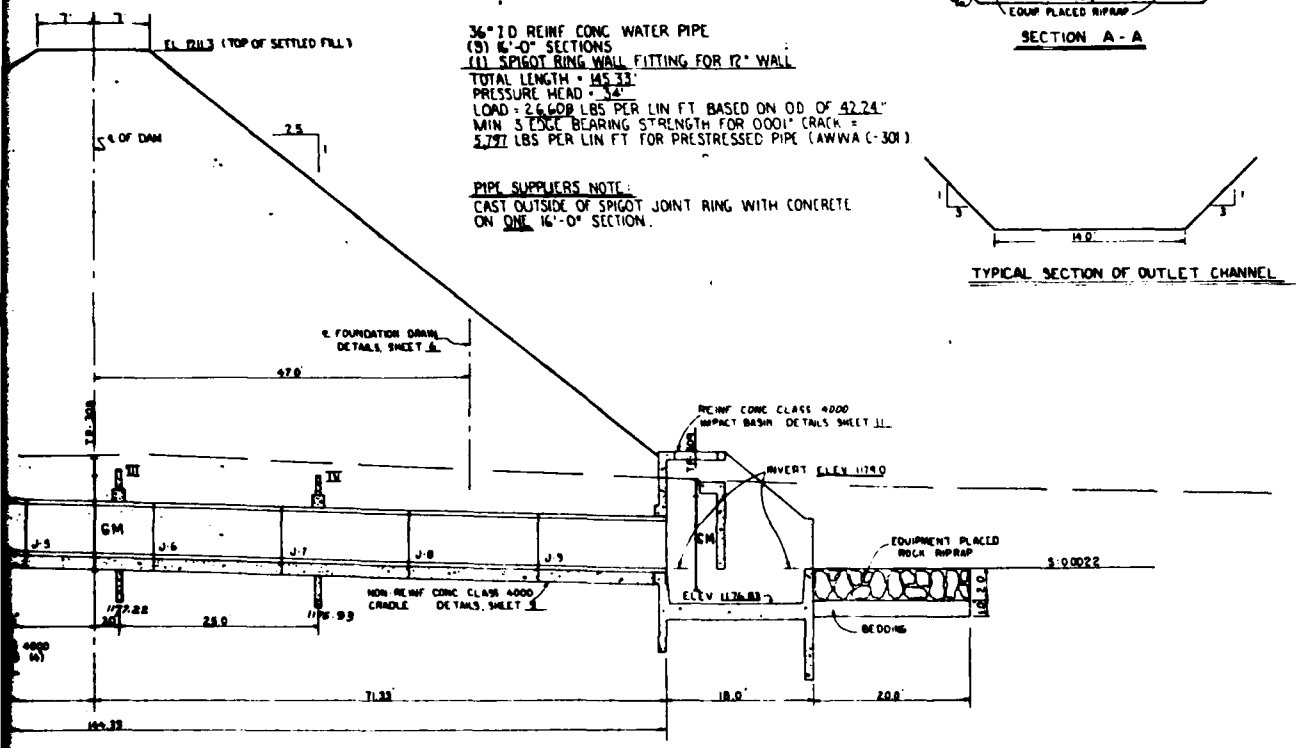
PLATE 6

D'APPOLONIA

DRAWN BY	G.J.G.	CHECKED BY		DRAWING NUMBER 80-778-B32
	5-26-81	APPROVED BY		



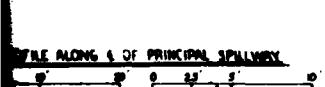




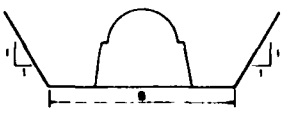
36" ID REINF CONC WATER PIPE
(9) 16'-0" SECTIONS
(1) SPIGOT RING WALL FITTING FOR 12" WALL
TOTAL LENGTH = 145.33'
PRESSURE HEAD = 54'
LOAD = 2,660B LBS PER LIN FT BASED ON OD OF 42.24"
MIN 3 EDGE BEARING STRENGTH FOR 0.01" CRACK = 5,797 LBS PER LIN FT FOR PRESTRESSED PIPE (AWWA C-301)

PIPE SUPPLIERS NOTE:
CAST OUTSIDE OF SPIGOT JOINT RING WITH CONCRETE ON ONE 16'-0" SECTION.

TYPICAL SECTION OF OUTLET CHANNEL



PROFILE ALONG ℄ OF PRINCIPAL SPILLWAY



TYPICAL SECTION-PRINCIPAL SPILLWAY EXCAVATION

STA 1+16 TO STA 2+48.5	B=12'
STA 2+48.5 TO STA 2+70	B=17'
STA 2+70 TO STA 2+84	B=20'

NANTICOKE CREEK WATERSHED PROJECT
SITE 9-C
FLOODWATER RETARDING DAM
BROOME COUNTY, NEW YORK
PLAN-PROFILE OF PRINCIPAL SPILLWAY
U.S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

Designed L.C. IBBITSON	Date 3/65	Approved by	
Drawn D. ANGELO W. YOLTON	3/65	Title	
Traced		Title	
Checked L.B	3/65	Sheet No. 6 of 14	Drawing No. NY-2008-P

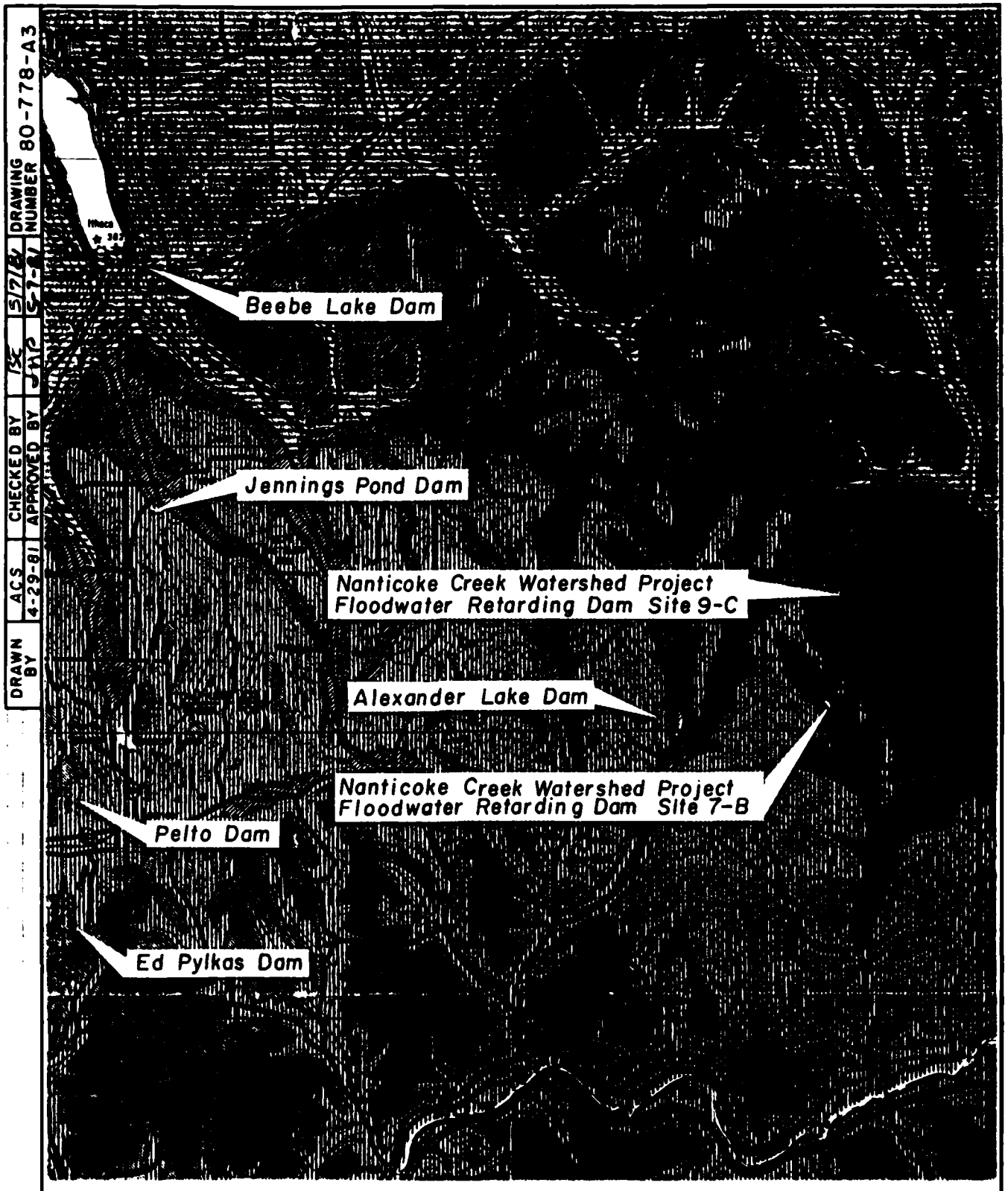
2

PLATE 7

D'APPOLONIA

APPENDIX F

GEOLOGY MAP



SCALE

0 2 4 6 8 10 miles

GEOLOGY MAP

REFERENCE:
GEOLOGIC MAP OF NEW YORK, FINGER LAKES SHEET
DATED: 1970, SCALE: 1:250,000

D'APPOLONIA

DRAWN BY	ACS	CHECKED BY	AE	3/7/81	DRAWING NUMBER 80-778-A6
	4-29-81	APPROVED BY	JHD	5-7-81	

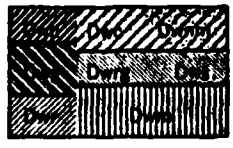
LEGEND

CANADAWAY GROUP
800-1200 ft. (240-370 m.)

Dcy Machias Formation—shale, siltstone; Rushford Sandstone; Caneadea, Canisteo, and Hume Shales; Canaseraga Sandstone; South Wales and Dunkirk Shales; In Pennsylvania: Towanda Formation—shale, sandstone.

JAVA GROUP
300-700 ft. (90-210 m.)

Dj Wiscoy Formation—sandstone, shale; Hanover and Pipe Creek Shales.



WEST FALLS GROUP
1100-1600 ft. (340-490 m.)

Dwn Nunda Formation—sandstone, shale.

Dwg West Hill and Gardeau Formations—shale, siltstone; Roricks Glen Shale; upper Beers Hill Shale; Grimes Siltstone.

Dwr lower Beers Hill Shale; Dunn Hill, Millport, and Moreland Shales.

Dwc Nunda Formation—sandstone, shale; West Hill Formation—shale, siltstone; Corning Shale.

Dwnm *"New Milford" Formation—sandstone, shale.*

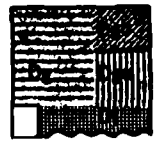
Dwrg Gardeau Formation—shale,. siltstone; Roricks Glen Shale.

Dws Slide Mountain Formation—sandstone, shale, conglomerate.

Dwm Beers Hill Shale; Grimes Siltstone; Dunn Hill, Millport, and Moreland Shales

SONYEA GROUP
200-1000 ft. (60-300 m.)

Ds In west: Cashaqua and Middlesex Shales.
In east: Rye Point Shale; Rock Stream ("Enfield") Siltstone; Pulteney, Sawmill Creek, Johns Creek, and Montour Shales.



GENESEE GROUP AND TULLY LIMESTONE
200-1000 ft. (60-300 m.)

Dg West River Shale; Genundewa Limestone; Penn Yan and Geneseo Shales; all except Geneseo replaced eastwardly by Ithaca Formation—shale, siltstone and Sherburne Siltstone.

Dgo Oneonta Formation—shale, sandstone.

Dgu Unadilla Formation—shale, siltstone.

Dt Tully Limestone.

GEOLOGY MAP LEGEND

REFERENCE:
GEOLOGIC MAP OF NEW YORK, FINGER LAKES SHEET
DATED: 1970, SCALE 1:250,000

D'APPOLONIA

APPENDIX G

STABILITY ANALYSES

OPTIONAL FORM NO. 10
5010-104

UNITED STATES GOVERNMENT

Memorandum

TO : W. S. Atkinson, State Conservation Engineer, SCS, Syracuse, New York 13210 DATE: March 10, 1965

FROM : Rey S. Decker, Head, Soil Mechanics Laboratory, SCS, Lincoln, Nebraska 68503

SUBJECT: ENG - Soil Tests 22 - New York WP-03, Nanticoke Creek, Site No. 9-C (Broome County)

ATTACHMENTS

1. Form SCS-354, Soil Mechanics Laboratory Data, 1 sheet.
2. Form SCS-355, Triaxial Shear Test Data, 1 sheet.
3. Form SCS-352, Compaction and Penetration Resistance Report, 4 sheets.
4. Form SCS-357, Summary - Slope Stability Analysis, 2 sheets.
5. Investigational Plans and Profiles.

INTERPRETATION AND DISCUSSION OF DATA

FOUNDATION MATERIALS:

A. Classification: The foundation at this site consists of alluvium overlying glacial till in the floodplain section. The abutments are glacial till.

The alluvium is logged as ML and the till is logged as GM.

B. Penetration Resistance: Standard penetration resistance tests showed blow counts of from 13 to 23 in the ML alluvium below water table. The till underlying the alluvium has blow counts from 26 to more than 100 blows per foot.

The Geologist calls attention to an organic silt zone in the vicinity of TP No. 2 and DH No. 52. This zone occurs within the surface 5 feet; he suggests removal of this material.

C. Strength and Consolidation: Outside of the low blow count material (6 blows per foot above water table) in the area of DH No. 52 and TP No. 2, the data indicates that the foundation strength will be adequate for the embankment planned and that the consolidation potential will be low.

D. Permeability: The Geologist expects the zone logged as clean gravels to be quite permeable.

2 -- W. S. Atkinson -- 3/10/65
Rey S. Decker
Subj: ENG - Soil Tests 22 - New York WP-08, Nanticoke Creek, Site No. 9-C (Broome County)

EMBANKMENT MATERIALS:

A. Classification: The borrow materials submitted represent the till. These samples have very comparable gradation and plasticity characteristics. They contain slightly more than 50 percent fines and about 25 to 30 percent gravel. The liquid limits are in the range of 26 to 28 and the PI's range from 7 to 9.

B. Compacted Density: Standard Proctor compaction tests were made on the fraction passing the 3/4-inch sieve. The tests were made in accordance with ASTM D-698-58T, Method C. The compacted material represents from 83 to 88 percent of the total sample.

The maximum densities obtained fell within the close range of 123.0 p.c.f. to 124.5 p.c.f.

C. Shear Strength: A triaxial shear test was made on the minus 3/4-inch fraction to represent the materials submitted. The test was made at a density of 121 p.c.f., which is equivalent to 97 percent of standard Proctor (ASTM D-698, Method C). The saturated shear strength values obtained were $\phi = 22°$, c = 250 p.s.f. The test values are suggested for design.

SLOPE STABILITY ANALYSIS:

Slope stability was checked with a Swedish circle method of analysis. The analysis considered the embankment only.

The proposed 3:1 upstream slope has a factor of safety of 1.53 with drawdown considered.

The proposed 2 1/2:1 downstream slope has a factor of safety of 1.56 with the phreatic line controlled by a drain at c/b = 0.6.

A summary of the analysis is attached.

SETTLEMENT ANALYSIS:

Settlement is expected to be uniform and no problems are anticipated due to differential settlement.

CONCLUSIONS AND RECOMMENDATIONS

A. Site Preparation: The channel banks and trench slopes that are normal to centerline should be no steeper than 3:1.

B. Cutoff Trench: A minimum cutoff trench depth of 5 feet is recommended for the abutments and the floodplain. Between ℄ Station 6+50 and ℄ Station 8+50 a trench depth of greater than 5 feet will be required to cut off the zone of clean gravel.

The trench backfill should be compacted to a minimum of 97 percent of standard Proctor (ASTM D-698, Method C) with the control based on the minus 3/4-inch fraction.

The placement moisture content should be near optimum.

C. Principal Spillway: Three locations were investigated. The foundation at the ℄ Station 9+30 location consists of till for the entire length of the conduit. This location was recommended by the Geologist. It appears to be the most desirable location from a foundation standpoint.

Based on the blow count data in test hole No. 53 (℄ Station 8+90), the till is expected to be nonyielding under the 26-foot fill at this location.

D. Drain: A drain is recommended to control the phreatic line within the embankment and also to provide a safe outlet for foundation seepage.

A trench drain with a pipe outlet is suggested. The drain should be located at about c/b = 0.6. It should extend up the abutments to normal pool elevation. A trench depth of about 6 feet is suggested.

The till contains more than 15 percent passing the 0.005 mm. size; therefore, any reasonably well-graded, clean sand-gravel mixture could be used for the drain. The ML alluvium and the gravel zone may require a special filter gradation.

E. Embankment Design:

1. Placement of Material: The borrow samples submitted represent a uniform till; therefore, a homogeneous embankment is recommended.

   The embankment material should be placed at a minimum of 97 percent of standard Proctor density with the control based on the fraction passing the 3/4-inch sieve (ASTM D-698, Method C). The placement moisture content should be near optimum.

2. Slopes: The proposed 3:1 upstream and 2 1/2:1 downstream slopes have acceptable factors of safety and are recommended.

4 -- W. S. Atkinson -- 3/10/65
Rey S. Decker
Subj: ENG - Soil Tests 22 - New York WP-08, Nanticoke Creek, Site No. 9-C (Broome County)

3. Settlement: An overfill allowance of 1.0 foot is suggested to compensate for residual consolidation within the fill and foundation.

Prepared by:

Lorn P. Dunnigan

Reviewed and Approved by:

Roland B. Phillips

Attachments

cc: Bernard S. Ellis, Syracuse, New York
Henry W. Davis, PennYan, New York
Richard J. McClimans, Binghamton, New York
H. M. Kautz, Upper Darby, Pennsylvania
W. L. Anderson, Syracuse, New York

SCS-355 (Rev. 4/59)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE

SOIL MECHANICS LABORATORY

Sample Number 65W1817

TRIAXIAL SHEAR TEST DATA

Project Nanticoke #9-C Location New York

Moisture-Density Data

Standard ☒ Max. γ 124.5 pcf
Modified ☐ Optimum Moisture 11.0 %
Curve No. IX of 4

L.L. 26 P.I. 3 Class CL G_s 2.74
% Finer Than: 0.002mm 14 0.005mm 26 #200 51
Other Factors Affecting Shear:
% Dispersion 43 % Salt ____
Other: ____

Specifications:

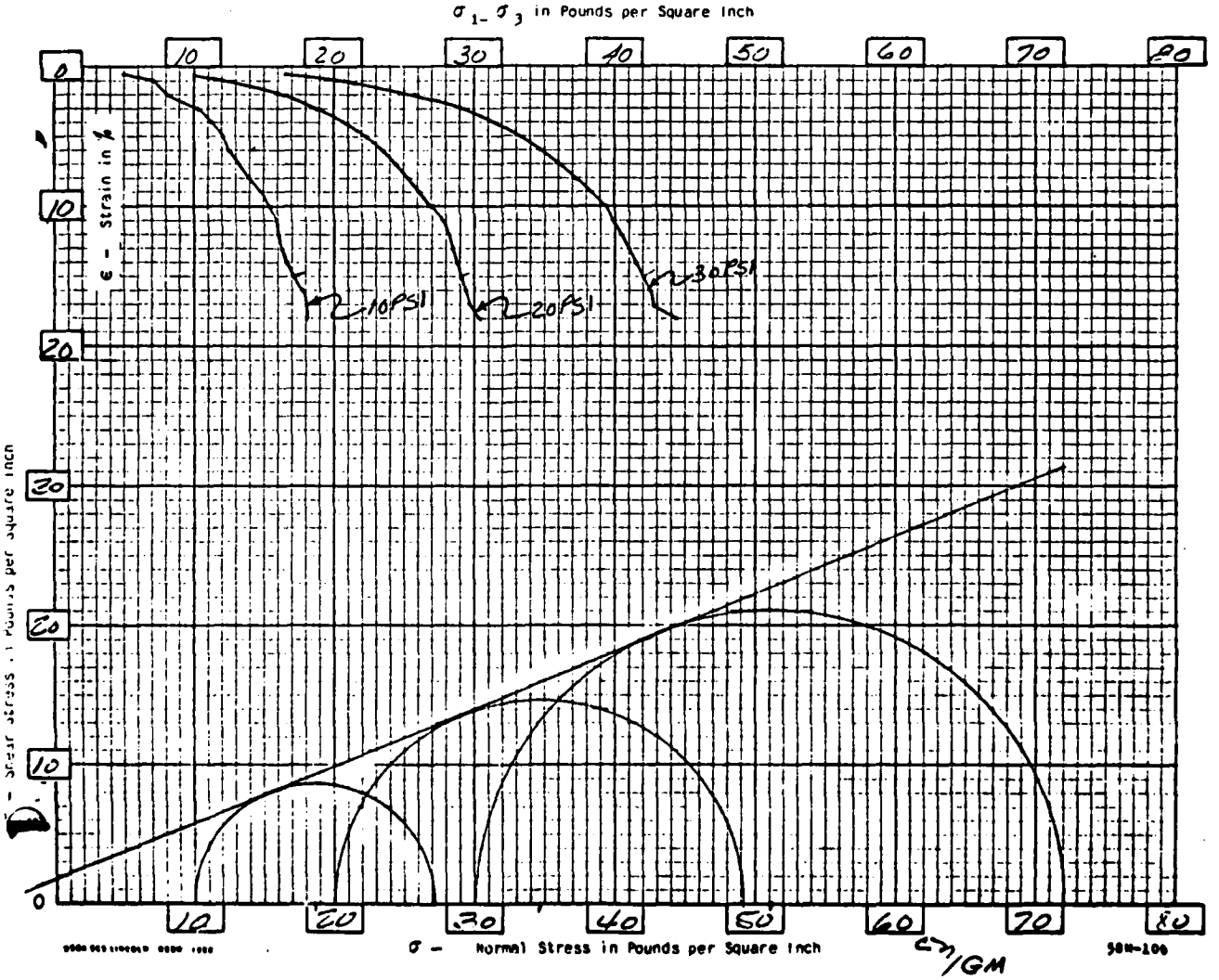
Specimen: Max. Height ____ Size < 3/4"
Diameter 4.0" Material

☒ Consolidated ☐ Drained
☐ Unconsolidated ☒ Undrained

☐ Undisturbed and Tested at: ☐ Natural Moisture ☐ Saturation
☒ Remolded and Tested at: 95 % of ☒ Standard ☐ Modified
with w = ____ % which is
☐ Lower than Optimum ☐ Optimum ☐ Higher than Optimum ☐ Saturated

Test Data

Dry Density γ pcf	% Max. Dry Den.	Moisture Content Start %	Moisture Content % Sat. Start	Moisture Content End %	Lateral Pressure σ_3	Consolidation Data Orig. e_0	Consolidation Data Final e_f	Stress at Failure $\sigma_1 - \sigma_3$	% Strain at Failure ϵ_f	Internal Friction ϕ Tan ϕ	Unit Cohesion
121.0	97.2	14.2	94.0	13.6	10	.4124	.383[a]	17.2	15	ϕ 22°	1.7 psi
120.4	96.7	14.3	93.5	12.6	20	.4196	.3701	29.2	15		250 psf
121.0	97.2	13.7	90.7	12.2	30	.4124	.3631	42.1	15	Tan ϕ .4044	



SCS -352 (10/57)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL MECHANICS LABORATORY

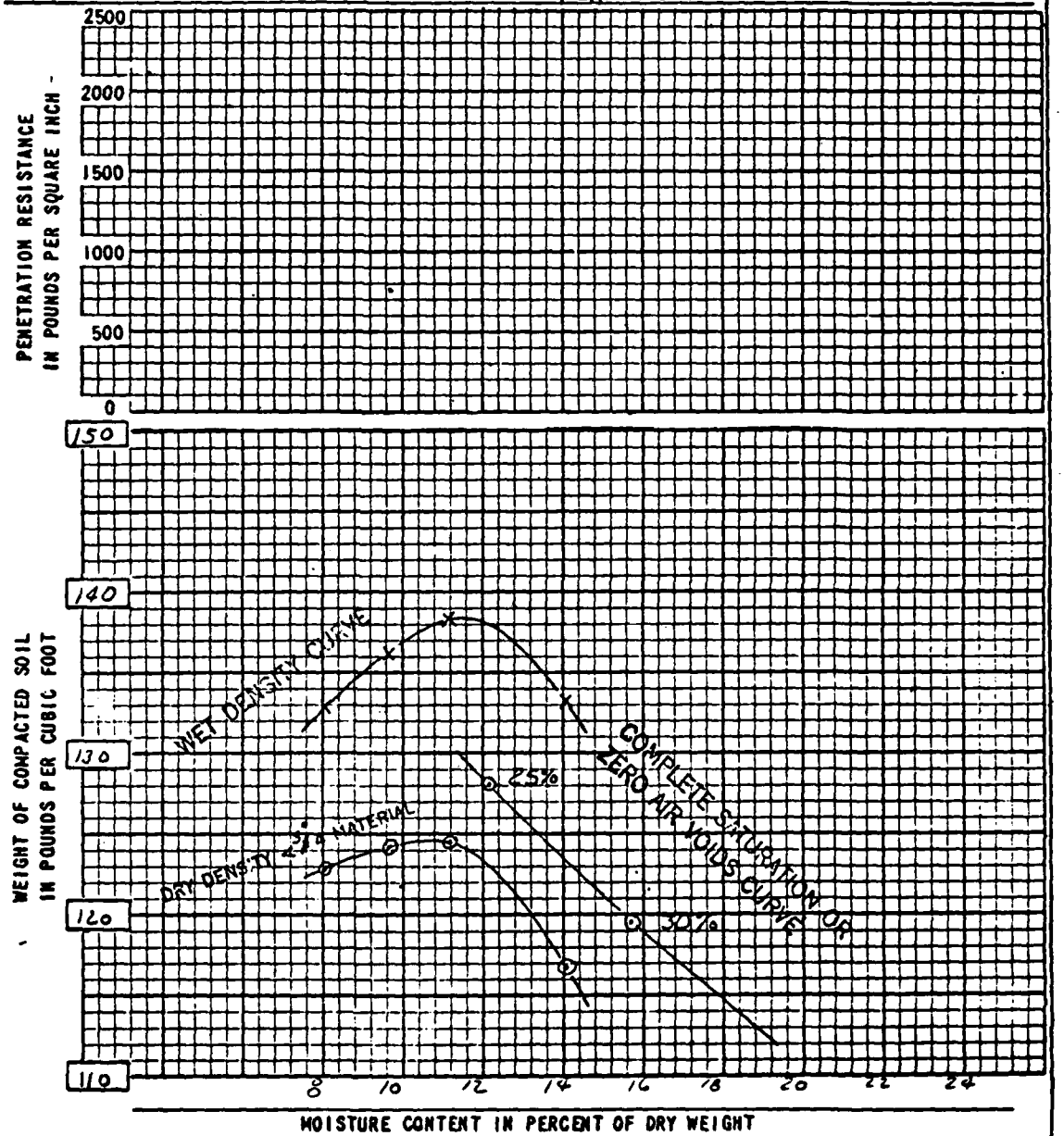
COMPACTION AND PENETRATION RESISTANCE REPORT

Date _____ Sample No.: Field 202.1 Lab 65W1817

Project Nanticoke Creek No. 9-C Location New York

Sample Location and Depth Emer. Spill. 10'-10.0'

Signature:



TYPE OF TEST	TEST PROCEDURE	Classification CL
☒ Standard Proctor	Weight of Hammer 5.5 Lbs.	83 % Material Compacted
☐ Modified AASHO	Drop 12 Inches	Passed 3/4" Sieve
☐ Other _____	Lifts 3	(Sp. Gr.) Gs - 2.74 gr/cc
ASTM D698-58T Method C	Vol. of Cylinder 1/30 Cu. Ft.	Curve 1X of 4X

58-M26

SCS-352 (10/57)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL MECHANICS LABORATORY

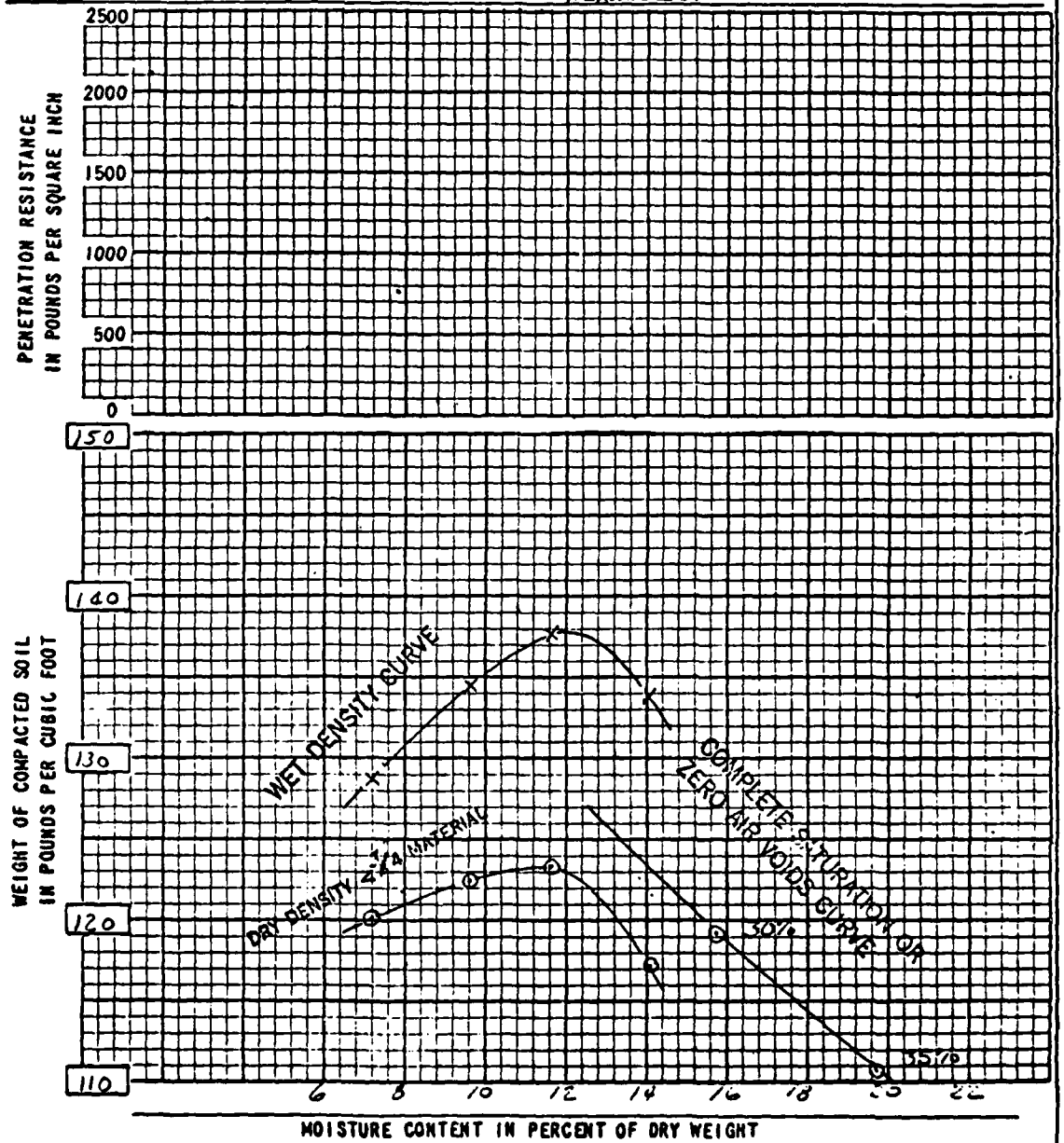
COMPACTION AND PENETRATION RESISTANCE REPORT

Date _____ Sample No.: Field 204.1 Lab 65W1818

Project Nanticoke Creek No. 9-C Location New York

Sample Location and Depth Emer. Spill. 10-12.0'

Signature:



TYPE OF TEST	TEST PROCEDURE	
☒ Standard Proctor	Weight of Hammer 5.5 Lbs.	Classification CL
☐ Modified AASHO	Drop 12 Inches	87 % Material Compacted
☐ Other _____	Lifts 3	Passed 3/4" Sieve
ASTM D698-58T Method C	Vol. of Cylinder 1/30 Cu. Ft.	(Sp. Gr.) Gs - 2.73 gr/cc
		Curve 2X of 4X

SD-M26

SCS-352 (10/57)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL MECHANICS LABORATORY

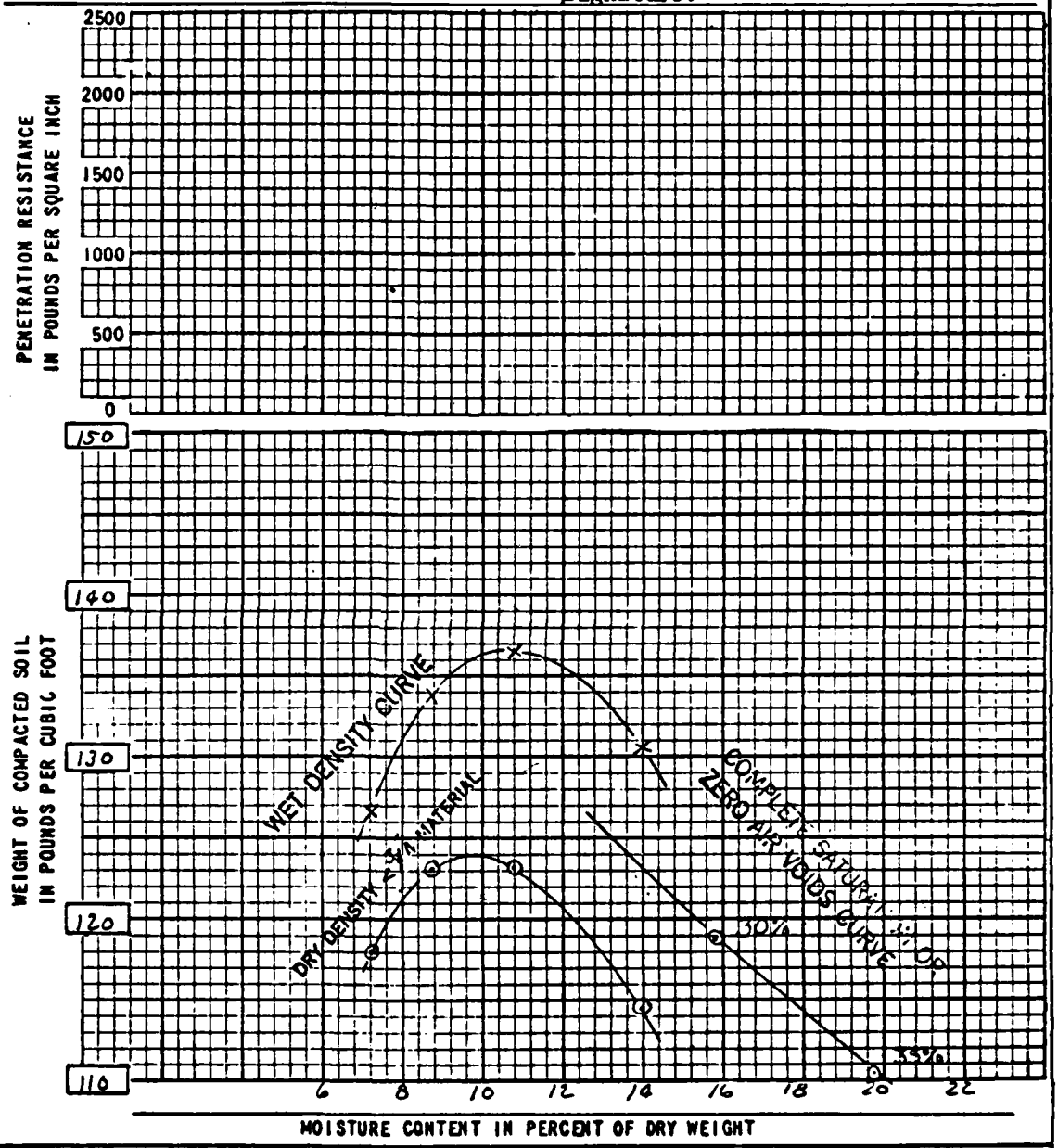
COMPACTION AND PENETRATION RESISTANCE REPORT

Date _____ Sample No.: Field 205/207.1 Lab 65W1819

Project Nanticoke Creek No. 9-C Location New York

Sample Location and Depth Emer. Spill 1.0'-11.0'

Signature:



TYPE OF TEST	TEST PROCEDURE	
☒ Standard Proctor	Weight of Hammer 5.5 Lbs.	Classification CL to CL-ML
☐ Modified AASHO	Drop 12 Inches	88 % Material Compacted
☐ Other _____	Lifts 3	Passed ¾" Sieve
ASTM D698-58T Method C	Vol. of Cylinder 1/30 Cu. Ft.	(Sp. Gr.) Gs - 2.72 gr/cc
		Curve 3X of 4X

58-M26

SCS -352 (10/57)

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL MECHANICS LABORATORY

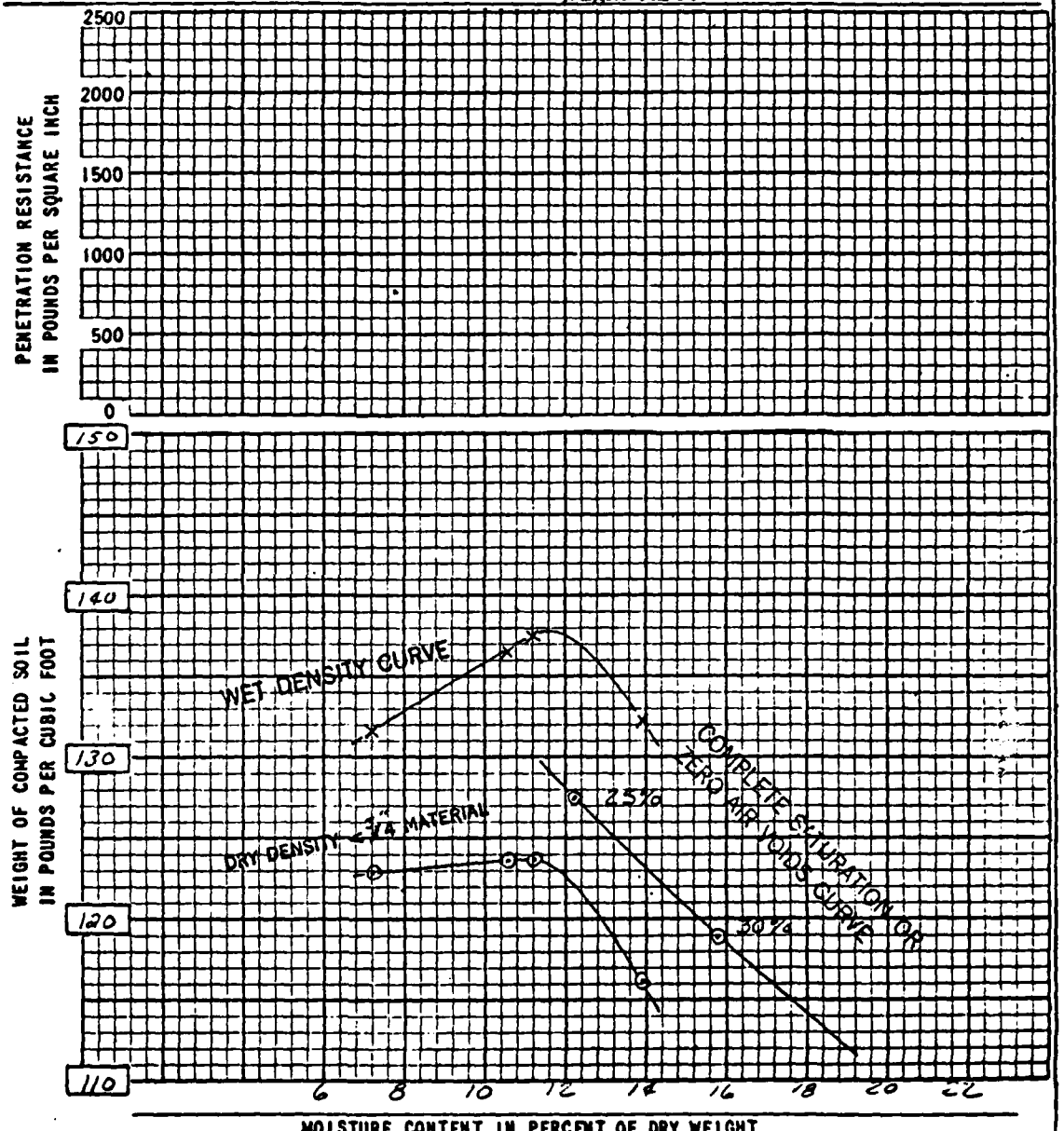
COMPACTION AND PENETRATION RESISTANCE REPORT

Date _____ Sample No.: Field 206.1 Lab 65W1820

Project Nanticoke Creek No. 9-C Location New York

Sample Location and Depth Emer. Spill 1.0'-13.0'

Signature:



TYPE OF TEST	TEST PROCEDURE	Classification CL - ML
☒ Standard Proctor	Weight of Hammer 5.5 Lbs.	08 % Material Compacted
☐ Modified AASHO	Drop 12 Inches	Passed 3/4" Sieve
☐ Other _____	Lifts 3	(Sp. Gr.) Gs - 2.72 gr/cc
ASTM D698-58T Method C	Vol. of Cylinder 1/30 Cu. Ft.	Curve 4X of 4X

58-M26

FORM SCS-357
10-58

U. S. DEPARTMENT OF AGRICULTURE
SOIL CONSERVATION SERVICE
SOIL MECHANICS LABORATORY

Sheet 1 of 2
Maximum Section

SUMMARY - SLOPE STABILITY ANALYSIS

State NEW YORK Project NANTICOKE CREEK SITE #9-C

Date 3-4-65 Analysis Made By A.W.L. Checked By T.C.H.

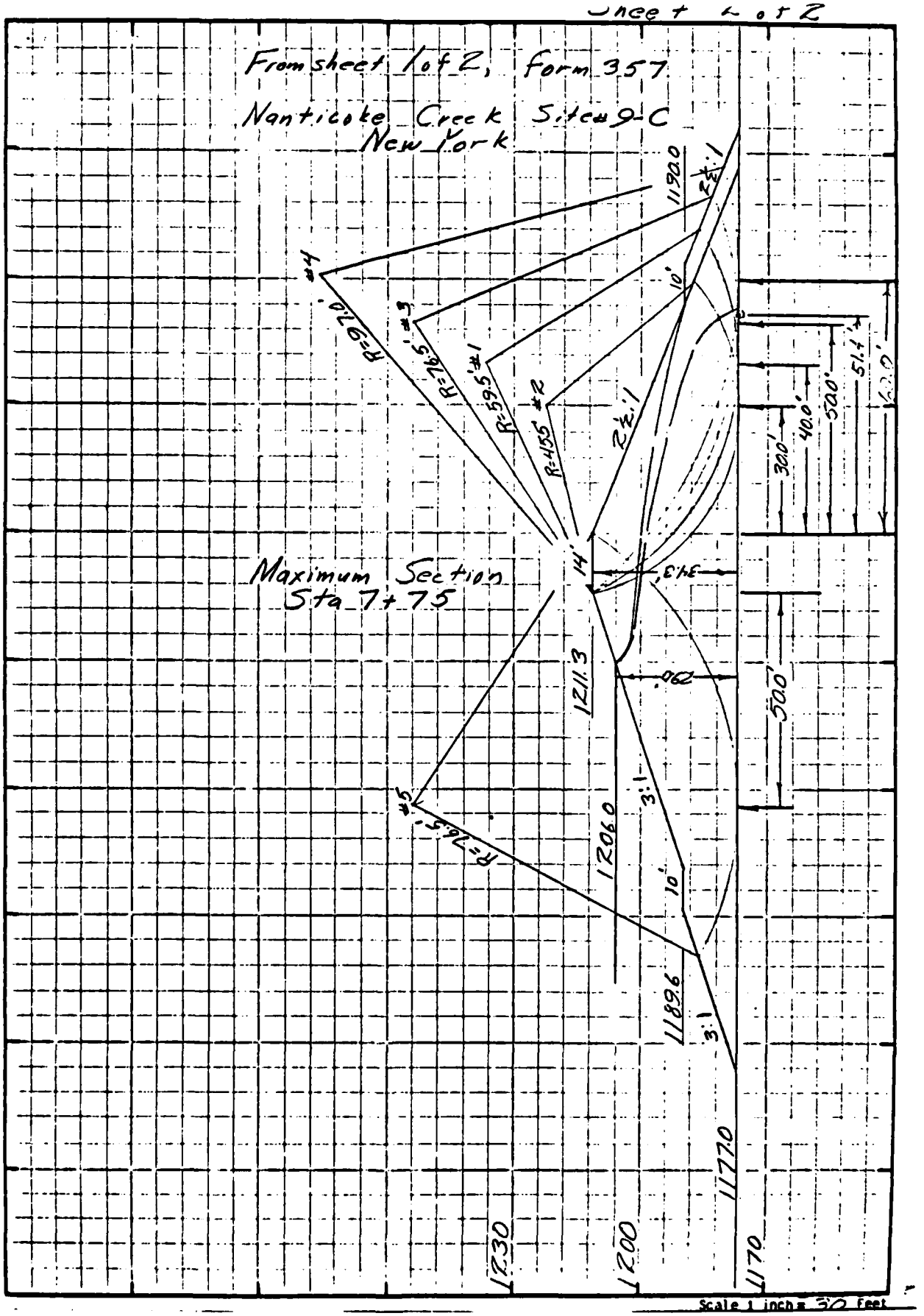
Method of Analysis SWEDISH CIRCLE

Location of Material					Emb 95% St'd CL					
Sample No.					65W1817					
γ_d					122.2					
γ_m					130.0					
γ_s					139.0					
γ_b					75.5					
Condition	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.	Opt.	Sat.
ϕ						22.2°				
Tan ϕ						0.404				
K										
C						250				

UPSTREAM SLOPE			
Trial	Slope	Conditions	Fs
5	3:1	Full drain-10' berm @ elev 1190.0-Arc cut from opp. sh'd'r thru Emb (22.0°-25°) only	1.53
		DOWNSTREAM SLOPE	
1	2½:1	No drain-No berm-Arc cut from opp. sh'd'r thru Emb (22.0°-25°) only	1.35
1A	2½:1	Same as #1 except 10' berm @ elev 1190.0	1.49
1B	2½:1	Drain @ γ_b=0.6-No berm-Arc cut from opp. sh'd'r thru Emb (22.0°-25°) only	1.57
2	2½:1	No drain-No berm-Arc cut from opp. sh'd'r thru Emb (22.0°-25°) only	1.51
3	2½:1	No drain-10' berm @ elev 1190-Arc cut from opp sh'd'r thru Emb (22.0°-25°) only	1.55

Drain from SLOPE (Cont.)			
Trial	Slope	Conditions	Fs
3A	2½:1	Same as #3 except Drain @ γ_b=0.6 & No berm	1.55
4	2½:1	No drain-10' berm @ elev 1190.0-Arc cut from opp. sh'd'r thru Emb (22.0°-25°) only	1.51
4A	2½:1	Same as #4 except Drain @ γ_b=0.6 & No berm	1.59
		Sat shear values used on all trials	

To be used to report to field offices data used for slope stability analyses and the results of the analyses. The right side of the form will be used for a sketch of the embankment on which the analyses have been made.


From sheet 1 of 2, Form 357
Nanticoke Creek Site 9-C
New York
Maximum Section
Sta 7+75
R=67.0' #4
R=76.5' #3
R=59.5' #1
R=455' #2
2:1
2:1
3:1
3:1
10'
10'
14'
3%
6%
11900
12113
12060
11896
11770
11730
1200
1170
300'
40.0'
500'
51.4'
500'
500'
Scale 1 inch = 30 feet

APPENDIX H

REFERENCES

APPENDIX H

REFERENCES

Broughton, J. G., D. W. Fisher, Y. W. Isachsen, and L. V. Rickard, 1966, "Geology of New York," New York State Museum and Science Service, Educational Leaflet 20, 50 pp.

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